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Series of National School Books.

FIRST BOOK

OF

ARITHMETIC,

FOR THE USE OF SCHOOLS.

Authorized by the Council of Public Instruction
for Upper Canada.

REPUBLISHED, BY SPECIAL SANCTION, AT
MONTREAL,
BY
ROBERT MILLER,
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1866.

T724

PREFACE.

IN this First Book, the Practical, and not the Theoretical part of Arithmetic is treated of, but it is not intended that Theory should be separated from Practice. The teacher may, by means of a blackboard and a piece of chalk, make the pupils more readily understand the rules than could be done by any written explanation, especially at this stage of their progress.

For the Theoretical part of Arithmetic, teachers and monitors are referred to the Second Book of Arithmetic, published by the Commissioners.

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ARITHMETICAL TABLES.

ADDITION TABLE.

2 and 1 are 3
2 — 2 — 4
2 — 3 — 5
2 — 4 — 6
2 — 5 — 7
2 — 6 — 8
2 — 7 — 9
2 — 8 — 10
2 — 9 — 11
2 — 10 — 12
2 — 11 — 13
2 — 12 — 14
3 and 1 are 4
3 — 2 — 5
3 — 3 — 6
3 — 4 — 7
3 — 5 — 8
3 — 6 — 9
3 — 7 — 10
3 — 8 — 11
3 — 9 — 12
3 — 10 — 13
3 — 11 — 14
3 — 12 — 15
4 and 1 are 5
4 — 2 — 6
4 — 3 — 7
4 — 4 — 8
4 — 5 — 9
4 — 6 — 10
4 — 7 — 11
4 — 8 — 12
4 — 9 — 13
4 — 10 — 14
4 — 11 — 15
4 — 12 — 16
5 and 1 are 6
5 — 2 — 7
5 — 3 — 8
5 — 4 — 9
5 and 5 are 10
5 — 6 — 11
5 — 7 — 12
5 — 8 — 13
5 — 9 — 14
5 — 10 — 15
5 — 11 — 16
5 — 12 — 17
6 and 1 are 7
6 — 2 — 8
6 — 3 — 9
6 — 4 — 10
6 — 5 — 11
6 — 6 — 12
6 — 7 — 13
6 — 8 — 14
6 — 9 — 15
6 — 10 — 16
6 — 11 — 17
6 — 12 — 18
7 and 1 are 8
7 — 2 — 9
7 — 3 — 10
7 — 4 — 11
7 — 5 — 12
7 — 6 — 13
7 — 7 — 14
7 — 8 — 15
7 — 9 — 16
7 — 10 — 17
7 — 11 — 18
7 — 12 — 19
8 and 1 are 9
8 — 2 — 10
8 — 3 — 11
8 — 4 — 12
8 — 5 — 13
8 — 6 — 14
8 — 7 — 15
8 — 8 — 16
8 and 9 are 1
8 — 10 — 18
8 — 11 — 19
8 — 12 — 20
9 and 1 are 10
9 — 2 — 11
9 — 3 — 12
9 — 4 — 13
9 — 5 — 14
9 — 6 — 15
9 — 7 — 16
9 — 8 — 17
9 — 9 — 18
9 — 10 — 19
9 — 11 — 20
9 — 12 — 21
11 and 1 are 12
11 — 2 — 1
11 — 3 — 1
11 — 4 — 15
11 — 5 — 16
11 — 6 — 1
11 — 7 — 1
11 — 8 — 1
11 — 9 — 20
11 — 10 — 21
11 — 11 — 22
11 — 12 — 23
12 and 1 are 13
12 — 2 — 14
12 — 3 — 15
12 — 4 — 16
12 — 5 — 17
12 — 6 — 18
12 — 7 — 19
12 — 8 — 20
12 — 9 — 21
12 — 10 — 22
12 — 11 — 23
12 — 12 — 24

MULTIPLICATION TABLE

Twice	3 times	4 times	5 times	6 times	7 times
1 are 2	1 are 3	1 are 4	1 are 5	1 are 6	1 are 7
2 — 4	2 — 6	2 — 8	2 — 10	2 — 12	2 — 14
3 — 6	3 — 9	3 — 12	3 — 15	3 — 18	3 — 21
4 — 8	4 — 12	4 — 16	4 — 20	4 — 24	4 — 28
5 — 10	5 — 15	5 — 20	5 — 25	5 — 30	5 — 35
6 — 12	6 — 18	6 — 24	6 — 30	6 — 36	6 — 42
7 — 14	7 — 21	7 — 28	7 — 35	7 — 42	7 — 49
8 — 16	8 — 24	8 — 32	8 — 40	8 — 48	8 — 56
9 — 18	9 — 27	9 — 36	9 — 45	9 — 54	9 — 63
10 — 20	10 — 30	10 — 40	10 — 50	10 — 60	10 — 70
11 — 22	11 — 33	11 — 44	11 — 55	11 — 66	11 — 77
12 — 24	12 — 36	12 — 48	12 — 60	12 — 72	12 — 84

---

8 times	9 times	10 times	11 times	12 times
1 are 8	1 are 9	1 are 10	1 are 11	1 are 12
2 — 16	2 — 18	2 — 20	2 — 22	2 — 24
3 — 24	3 — 27	3 — 30	3 — 33	3 — 36
4 — 32	4 — 36	4 — 40	4 — 44	4 — 48
5 — 40	5 — 45	5 — 50	5 — 55	5 — 60
6 — 48	6 — 54	6 — 60	6 — 66	6 — 72
7 — 56	7 — 63	7 — 70	7 — 77	7 — 84
8 — 64	8 — 72	8 — 80	8 — 88	8 — 96
9 — 72	9 — 81	9 — 90	9 — 99	9 — 108
10 — 80	10 — 90	10 — 100	10 — 110	10 — 120
11 — 88	11 — 99	11 — 110	11 — 121	11 — 132
12 — 96	12 — 108	12 — 120	12 — 132	12 — 144

EXTENDED MULTIPLICATION TABLE

13 times	14 times	15 times	16 times	17 times	18 times	19 times
2 are 26	2 are 28	2 are 30	2 are 32	2 are 34	2 are 36	2 are 38
3 — 39	3 — 42	3 — 45	3 — 48	3 — 51	3 — 54	3 — 57
4 — 52	4 — 56	4 — 60	4 — 64	4 — 68	4 — 72	4 — 76
5 — 65	5 — 70	5 — 75	5 — 80	5 — 85	5 — 90	5 — 95
6 — 78	6 — 84	6 — 90	6 — 96	6 — 102	6 — 108	6 — 114
7 — 91	7 — 98	7 — 105	7 — 112	7 — 119	7 — 126	7 — 133
8 — 104	8 — 112	8 — 120	8 — 128	8 — 136	8 — 144	8 — 152
9 — 117	9 — 126	9 — 135	9 — 144	9 — 153	9 — 162	9 — 171

PENCE TABLE.

d.		s.	d.	d.		s.	d.	d.		s.	d.	d.		s.	d.
12	are	1	0	35	are	2	11	57	are	4	9	79	are	6	7
13	—	1	1	36	—	3	0	58	—	4	10	80	—	6	8
14	—	1	2	37	—	3	1	59	—	4	11	81	—	6	9
15	—	1	3	38	—	3	2	60	—	5	0	82	—	6	10
16	—	1	4	39	—	3	3	61	—	5	1	83	—	6	11
17	—	1	5	40	—	3	4	62	—	5	2	84	—	7	0
18	—	1	6	41	—	3	5	63	—	5	3	85	—	7	1
19	—	1	7	42	—	3	6	64	—	5	4	86	—	7	2
20	—	1	8	43	—	3	7	65	—	5	5	87	—	7	3
21	—	1	9	44	—	3	8	66	—	5	6	88	—	7	4
22	—	1	10	45	—	3	9	67	—	5	7	89	—	7	5
23	—	1	11	46	—	3	10	68	—	5	8	90	—	7	6
24	—	2	0	47	—	3	11	69	—	5	9	91	—	7	7
25	—	2	1	48	—	4	0	70	—	5	10	92	—	7	8
26	—	2	2	49	—	4	1	71	—	5	11	93	—	7	9
27	—	2	3	50	—	4	2	72	—	6	0	94	—	7	10
28	—	2	4	51	—	4	3	73	—	6	1	95	—	7	11
29	—	2	5	52	—	4	4	74	—	6	2	96	—	8	0
30	—	2	6	53	—	4	5	75	—	6	3	97	—	8	1
31	—	2	7	54	—	4	6	76	—	6	4	98	—	8	2
32	—	2	8	55	—	4	7	77	—	6	5	99	—	8	3
33	—	2	9	56	—	4	8	78	—	6	6	100	—	8	4
34	—	2	10												

EXTENDED PENCE TABLE.

d.		£	s.	d.	d.		£	s.	d.	d.		£	s.	d.	d.		£	s.	d.
140	are	0	11	8	1300	are	5	8	4	2500	are	10	8	4	3700	are	15	8	4
200	—	0	16	8	1400	—	5	16	8	2600	—	10	16	8	3800	—	15	16	8
240	—	1	0	0	1440	—	6	0	0	2640	—	11	0	0	3840	—	16	0	0
300	—	1	5	0	1500	—	6	5	0	2700	—	11	5	0	3900	—	16	5	0
400	—	1	13	4	1600	—	6	13	4	2800	—	11	13	4	4000	—	16	13	4
480	—	2	0	0	1680	—	7	0	0	2880	—	12	0	0	4080	—	17	0	0
500	—	2	1	8	1700	—	7	1	8	2900	—	12	1	8	4200	—	17	10	0
600	—	2	10	0	1800	—	7	10	0	3000	—	12	10	0	4300	—	17	18	4
700	—	2	18	4	1900	—	7	18	4	3100	—	12	18	4	4320	—	18	0	0
720	—	3	0	0	1920	—	8	0	0	3120	—	13	0	0	4400	—	18	6	8
800	—	3	6	8	2000	—	8	6	8	3200	—	13	6	8	4500	—	18	15	0
900	—	3	15	0	2100	—	8	15	0	3300	—	13	15	0	4560	—	19	0	0
960	—	4	0	0	2160	—	9	0	0	3360	—	14	0	0	4700	—	19	11	8
1000	—	4	3	4	2200	—	9	3	4	3400	—	14	3	4	4800	—	20	0	0
1100	—	4	11	8	2300	—	9	11	8	3500	—	14	11	8	4900	—	20	8	
1200	—	5	0	0	2400	—	10	0	0	3600	—	15	0	0	5000	—	20	16	

SIGNS USED IN ARITHMETIC.

$+$ named plus, signifies Addition, as $4+2$ equal 6.
$-$ named minus, signifies Subtraction, as $5-2$ equal 3.
$\times$ multiplied by, signifies Multiplication, as 4×2 equal 8.
$\div$ divided by, signifies Division, as $10\div 2$ equal 5.
$=$ equal to, signifies Equality, as $2+4=6$.
: is to, :: so is, : to — signifies Proportion, as $1:2::3:6$. These figures are thus read, as 1 is to 2 so is 3 to 6

$\sqrt{\ }$ marks the Square root, as $\sqrt{4}=2$.
$\sqrt[3]{\ }$ marks the Cube root, as $\sqrt[3]{8}=2$.

MONEY.

4 farthings = 1 penny
12 pence = 1 shilling.
20 shillings = 1 pound.
21 shillings = 1 guinea.

£ denotes pounds, *s.* shillings, and *d.* pence.
¼ " one farthing, or one-quarter of any thing.
½ " a halfpenny, or a half of any thing.
¾ " three farthings, or three-quarters of any thing

AVOIRDUPOIS WEIGHT.

		marked
16 drams (*dr.*)	= 1 ounce,	*oz.*
16 ounces	= 1 pound,	*lb.*
28 pounds	= 1 quarter,	*qr.*
4 quarters or 112lb.	= 1 hundred weight,	*cwt.*
20 hundred weight	= 1 ton,	*T.*

14 pounds make one stone, and 8 stone 1 hundred weight.

This weight is used for bread, meat, grocery, for goods in general, and for all the metals except gold and silver.

TROY WEIGHT.

		marked
24 grains (*gr.*)	= 1 pennyweight,	*dwt.*
20 pennyweights	= 1 ounce,	*oz.*
12 ounces	= 1 pound,	*lb.*

This weight is used for gold, silver, jewels, and liquors.

APOTHECARIES' WEIGHT.

		marked
20 grains	= 1 scruple,	*scr.*
3 scruples	= 1 dram,	*dr.*
8 drams	= 1 ounce,	*oz.*
12 ounces	= 1 pound,	*lb.*

Apothecaries use this weight in mixing their medicines; but they buy and sell by avoirdupois weight.

LONG MEASURE.

		marked
12 lines	= 1 inch,	*in.*
12 inches	= 1 foot,	*ft.*
3 feet	= 1 yard,	*yd.*
5½ yards	= 1 perch,	*per.*
40 perches	= 1 furlong,	*fur.*
8 furlongs	= 1 mile,	*ml.*
3 miles	= 1 league,	*lg.*
60 Geographical miles, or 69½ British miles,	= 1 degree,	*deg.*
360 degrees	= the earth's circumference.	

An inch is supposed to be equal to three barley-corns in length. Seven yards Irish equal one perch. Eleven miles Irish are equal to fourteen miles English. Four inches make one hand, used in measuring horses.

CLOTH MEASURE.

		marked
2¼ inches	= 1 nail,	*nl.*
4 nails	= 1 quarter,	*qr.*
4 quarters	= 1 yard,	*yd.*

The Flemish ell is 3 quarters of a yard; the English ell 5 quarters of a yard; and the French ell 6 quarters of a yard.

SQUARE OR LAND MEASURE.

			marked
144 square inches	= 1	square foot,	*sq. ft.*
9 square feet	= 1	square yard,	*sq. yd.*
30¼ square yards	= 1	square perch,	*sq. per.*
40 square perches	= 1	rood,	*rd.*
4 roods	= 1	acre,	*ac.*
640 acres	= 1	square mile,	*sq. mile*

In Ireland 49 square yards make 1 square pole or perch. The square of any number is obtained by multiplying it by itself; 12 multiplied by 12=144, the square of 12.

CUBIC OR SOLID MEASURE.

1728 cubic inches	= 1	cubic foot.
27 cubic feet	= 1	cubic yard.
40 cubic feet of rough timber, or 50 cubic feet of hewn timber,	= 1	ton or load.
42 cubic feet	= 1	ton of shipping

A cube is a solid figure, similar to dice, and has six equal sides. The cube of any number is obtained by multiplying it twice by itself; thus, 12×12×12=1728, the cube of 12.

MEASURE OF CAPACITY.

			marked
4 gills	= 1	pint,	*pt.*
2 pints	= 1	quart,	*qt.*
4 quarts	= 1	gallon,	*gal.*
2 gallons	= 1	peck,	*pk.*
4 pecks	= 1	bushel,	*bush.*
8 bushels	= 1	quarter,	*qr.*
5 quarters	= 1	load,	*ld.*

By this measure both liquids and dry goods are measured. The gill, pint, quart, gallon, are used for liquids. The peck, bushel, quarter, load, are used for dry goods. The gallon contains 277,274 cubic inches.

The measure formerly called heaped measure is now, by Act of Parliament, declared illegal.

Ale, wine, and beer were formerly measured by different measures. In some places a barrel of beer contains 32, in some 34, and in others 36 gallons. A hogshead of ale was computed to contain 54 gallons, a hogshead of wine 63 gallons.

2 hogsheads make 1 pipe, or butt.
2 pipes, or butts, make 1 tun.

WOOL WEIGHT.

			marked
7 pounds	=	1 clove,	*cl.*
2 cloves	=	1 stone,	*st.*
2 stones	=	1 tod,	*td.*
6½ tods	=	1 wey,	*wy*
2 weys	=	1 sack,	*sk.*
12 sacks	=	1 last,	*la.*

TIME.

			marked
60 seconds (*sec.*)	=	1 minute,	*min.*
60 minutes	=	1 hour,	*hr.*
24 hours	=	1 day,	*da.*
7 days	=	1 week,	*wk.*
12 months, or 52 weeks and 1 day, or 365 days,	=	1 year,	*yr.*

☞ **Every fourth year contains 366 days, and is called leap year.**

DAYS IN EACH MONTH.

Thirty days hath September,
April, June, and November;
All the rest have thirty-one,
February twenty-eight alone,
But in leap year twenty-nine.

DIVISIONS OF THE CIRCLE.

			marked
60 seconds (″)	=	1 minute,	*min.* or ′
60 minutes	=	1 degree,	*deg.* or °
30 degrees	=	1 sign,	*S.*
12 signs	=	1 circle of the Zodiac,	*C.*

QUANTITIES.

			marked
12 articles	=	1 dozen,	*doz.*
20 articles	=	1 score,	*sc.*
144 articles	=	1 gross,	*gr.*
24 sheets paper	=	1 quire,	*qr.*
20 quires	=	1 ream,	*rm.*

NUMERATION TABLE.

1	Units.
21	Tens.
,321	Hundreds.
4,321	Thousands.
54,321	X. of Thousands.
654,321	C. of Thousands.
7.654,321	Millions.
87.654,321	X. of Millions.
987.654,321	C. of Millions.
1,987.654,321	M. of Millions.
21,987.654,321	X. M. of Millions.
321,987.654,321	C. M. of Millions.
4.321,987.654,321	Billions.

ROMAN NOTATION.

M.	D.	C.	L.	X.	V	I.
1000	500	100	50	10	5	1

EXERCISES IN NUMERATION.

Read, or write down in words, the numbers signified by the following figures :

1. 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.
2. 10, 11, 14, 16, 19, 20, 42, 18, 17.
3. 200, 420, 607, 956, 473, 247, 364.
4. 912, 874, 783, 650, 202, 604, 510.
5. 4000, 2700, 8601, 7036, 2101, 1060.
6. 1010, 7030, 4600, 9111, 4076, 5870.
7. 26012, 70101, 42100, 36100, 90201.
8. 700000, 701020, 926427, 104206.
9. 9000000, 9764268, 8202100, 5023067.
10. 2600060, 4101010, 2004000, 1402149.
11. 40000000, 29602687, 50026017, 1670020.
12. 941268767, 267602607, 401467680.
13. 296026876, 710020010, 270603050.
14. 1402360740, 3460760010, 4023601497.
15. 7042603714, 5079607906, 1704070600.
16. 81462306012, 46007687681, 94086421360.
17. 14023641201, 20860002001, 40002000202.
18. 907060206204, 240026100201, 590960126020.

EXERCISES IN NOTATION.

Express in Figures the following Numbers.

1. Six, —seven,—nine,—eight,—five, — ten, — twelve, — fourteen,—sixteen,—eighteen,—twenty,—nineteen.

2. Seventy-four,—twenty-six,—thirty-one,—forty-nine,— fifty-eight,—sixty-two—seventy-six,—seventy-seven—ninety-seven,—eighty-four,—fifty-five,—ninety-nine.

3. One hundred,—one hundred and four,—two hundred and forty-four,—six hundred and ninety-one,—seven hundred and fifty,—nine hundred and nine,—nine hundred and ninety-nine,—eight hundred and two.

4. Four thousand,—four thousand two hundred,—five thousand three hundred and fifty-two,—six thousand seven hundred and five,—seven thousand and fifty,—nine thousand and two,—eight thousand and eighty,—six thousand seven hundred and seven.

5. Ten thousand,—fifteen thousand five hundred and sixty,—nineteen thousand and nineteen,—twenty-six thousand five hundred and ninety-five,—thirty-eight thousand and thirty-eight,—forty thousand and forty,—fifty-six thousand five hundred and two,—seventy thousand seven hundred and seventy-seven

6. Four hundred thousand,—four hundred thousand and forty,—six hundred thousand seven hundred and seven,— nine hundred and eighty thousand,—two hundred and fifty-six thousand nine hundred and seventy-five,—seven hundred thousand seven hundred and seven,—nine hundred and sixty-four thousand two hundred and fifty-nine.

7. Six millions,—five millions four hundred and ninety-three thousand,—eight millions forty thousand four hundred and two,—seven millions four hundred and ninety-three thousand seven hundred and sixty-five,—ten millions ten thousand and ten,—twenty millions two hundred and forty thousand six hundred and six,—fifty-three millions fifty-three thousand and fifty-three,—eight hundred and fifty-three millions nine hundred and forty-eight thousand six hundred and fifty-three,—two hundred and three millions four hundred and six thousand five hundred and eight —nine hundred and ninety-three millions.

SIMPLE ADDITION.

Addition is the method of finding one number equal to two or more numbers.

Add together 423, 134, 267.

Rule with Example.—Write the numbers under each other, so that units may stand under units, tens under tens, hundreds under hundreds, &c. Draw a line under them. Add the figures in the right-hand column together; thus 7 and 4 make 11, 11 and 3 make 14. Put down	423 134 267 824

the figure 4 of the number 14. Take the one of the 14, and add it to the next column; thus, 1 and 6 make 7, 7 and 3 make 10, 10 and 2 make 12. Put down the figure 2 of the 12. Add the figure 1 of the 12 to the next column, thus 1 and 2 make 3, 3 and 1 make 4, 4 and 4 make 8. Put down the 8. The number 824 is called the *Sum*.

EXERCISES.

1	2	2	3	1	4	3	3
2	3	0	1	5	1	2	4
3	4	6	4	2	4	6	5
6	9	8	8	8	9	11	12

2	4	6	3	4	5	3	4
1	2	4	4	3	4	7	6
3	3	2	5	6	7	8	9

12	21	23	14	21	42
11	12	24	35	34	23
23	24	35	43	75	97
46	57	82	92	130	162

41	34	26	37	42	23
24	24	42	25	56	59
36	53	59	74	35	64

(1)	(2)	(3)	(4)
412	243	623	354
346	225	146	236
427	678	579	875

(5)	(6)	(7)	(8)
264	450	547	856
368	407	653	479
752	670	865	627
865	538	276	894

(9)	(10)	(11)	(12)
246	457	47	8
78	608	602	70
604	92	68	926
40	400	720	47
7	78	79	5

(13)	(14)	(15)	(16)
5129	4268	3687	2407
7142	2426	4215	798
9687	4276	708	46
4312	8507	9362	7082
8687	2390	96	579

(17)	(18)	(19)	(20)
5126	2427	5036	786
1472	768	784	5705
6826	9412	6070	1070
9687	893	85	687
2764	4026	7507	5368
4279	475	687	759

(21)	(22)	(23)	(24)
42674	24755	45768	46587
34126	65843	86270	54293
68768	26879	4587	43986
28642	43653	578	5079
65768	68754	49060	81
74387	56287	15709	641
96728	65423	70471	93076

25. How many do 7 and 4 and 8 and 24 and 62 make?

26. How many are 42 and 64 and 40 and 68 and 79?

27. How many do 67 and 79 and 93 and 104 and 65 make?

28. How many do 426 and 67 and 240 and 742 make?

29. Add together 6479 and 846 and 70 and 567 and 7426.

30. Add 742+64+8+341+804+60+642+790+806.

31. Add 7260+1404+8496+2413+46+4756+3326.

32. Add 4126+27304+2687+426+876846+746897.

33. Add 76876+2046+896874+6876874+4268+4276.

34. Add 367068+64768+94687+6870+2489+264.

35. What is the amount of four hundred and sixty-three,—five thousand and sixty-four,—seventy thousand and ninety-eight,—and fifty?

36. Add together seven hundred and ninety-six,—five thousand four hundred and forty,—nine hundred and eight,—five thousand four hundred and nine,—two hundred and wo thousand and fifty,—ninety-six thousand and nine,—four hundred and one.

37. How much do the following sums of money amount to, when added together: £7966,—£864,—£46,—£2048,—£46897?

38. I saw four large baskets full of apples: in one of the baskets there were four hundred and ninety-four apples, in another three hundred and sixty-eight, in another nine hundred and eighty, and in another four hundred and four; how many apples were there in the four baskets?

39. I gave John 12 apples, James 15, Patrick 20, and I had still 25 remaining; how many apples had I at first?

40. In a school which I visited lately, there were six classes: in the first there were 23 boys, in the second 18, in the third 32, in the fourth 27, in the fifth 56, and in the sixth 48; can you tell me how many boys there were in the school?

41. A man walked 26 miles on Monday, 34 on Tuesday, 46 on Wednesday, 37 on Thursday: on Friday, being unable to walk, he procured a horse and rode 41 miles, and completed his journey on Saturday, having travelled that day 67 miles; how many miles did he travel during the week?

42. A gentleman planted on his property 478 oaks, 748 beeches, 64027 firs, 409 apple-trees, 1764 pear-trees, 878 cherry-trees, and 87 peach-trees; how many trees did he plant in all?

43. If James has 74 marbles, John 213, Tom 185, Henry 309, William 834, and Patrick 648, how many have they in all?

44. A farmer laid out on oxen £348, on hôrses £487, on sheep £964, on cows £189, on laboring utensils £209; how much did he lay out altogether?

45. In a house there were nine windows in front, and each window had twelve panes of glass. In the rear there were six windows, and each of these windows had nine panes of glass; how many panes of glass were there in all the windows?

46. A fruiterer bought six chests of oranges. In the first chest there were 468 oranges; in the second 679; in the third 804; in the fourth 979; in the fifth 1042; in the sixth 1709: how many oranges were there in all the chests?

47. A linen-draper sold 46 yards of cloth on Monday; 78 on Tuesday; 65 on Wednesday; the same quantity on Thursday; 64 on Friday; and 97 on Saturday: how many yards of cloth did he sell during the week?

48. A grocer received for goods sold on Monday £4; on Tuesday £6; on Wednesday £10; on Thursday £9; on Friday £13; and on Saturday as much as he had received all the former days of the week: how much did he receive during the week for goods?

SIMPLE SUBTRACTION.

Subtraction is the method of finding the difference between two numbers.

From 6287 take 4895.

Rule with Example.—Place the less number under the greater, so that units may stand under units, tens under tens, &c. Draw a line under them. Begin at the units' place; that is, at the 5. Take 5 from 7 and 2 remain. Put down the 2 under the 5. Go on to the next figure, which is 9. Take 9 from 8; this cannot be done: when this is the case, add 10 to the upper figure, which will make it 13. Take 9 from 13 and 4 remain. Put down the 4. Whenever 10 has been added, as it was to the 8, one is to be added to the next figure. Thus, add 1 to 8, which makes 9. Take 9 from 2; it cannot be done: then as before, add 10 to the 2. Now take 9 from 12 and 3 remain. Put down the 3. Add 1 to 4; it will make 5. Take 5 from 6 and 1 remains. Put down the 1. The sum 1842 is called the *Remainder*, the *Difference*, or the *Excess*. The number from which the subtraction is made, viz. 6237, is called the *Minuend*. The number which is subtracted, viz. 4895, is called the *Subtrahend*.

6237
4895
1842

EXERCISES.

426	647	754	827	968
214	423	621	408	412
212	224	183	424	556
6[illegible]8	498	783	869	548
4[illegible]1	132	172	217	213
423	742	834	546	643
279	489	478	298	169
144	253	356	248	474

582	715	934	604	540
496	268	748	257	76
86	447	186	347	464

(1)	(2)	(3)	(4)	(5)
462	628	821	602	714
278	147	479	146	178

(6)	(7)	(8)	(9)	(10)
648	741	610	100	101
268	278	79	4	11

(11)	(12)	(13)	(14)
42654	86871	73268	98643
26479	17928	47296	27896

(15)	(16)	(17)	(18)
74603	91020	41021	40000
37684	12647	768	1001

(19)	(20)	(21)	(22)
42681	42890	81000	45301
19697	27601	2641	20009

(23)	(24)	(25)
641026831	614102013	148120718
278904896	178906844	74198648

(26)	(27)	(28)
861264981	921002461	181201041
248600989	198007049	89890122

29. 741826421741 — 427984642814
30. 841298471812 — 71489641204
31. 812014001012 — 107987862141
32. 431701468642 — 7126142657
33. 614214687648 — 196412741689
34. 419000100014 — 2120101706

35. From seven hundred and nine thousand four hundred and twenty-seven, take two hundred and fifty-one thousand eight hundred and seventy-two.

36. From two millions two hundred and two thousand and two, take nine hundred and ninety-six thousand and seven.

37. What is the difference between sixty-five hundred thousand and four, and twenty-nine hundred thousand seven hundred and sixty?

38. How much does sixty-four thousand two hundred and four exceed six thousand two hundred and forty-nine?

39. John lent James £9071, of this sum he has received back £999; how much has James yet to pay?

40. On a cherry-tree there were 2046 cherries, of these 1875 were gathered; how many remained?

41. Columbus discovered America in the year 1492; how many years is it from that time to 1836?

42. In a certain school there are 436 boys, of these only 264 can write; how many are unable to write?

43. In one of the National Schools there are 427 boys; in another there are 249; how many more are there in the one than in the other?

44. John had 202 nuts in his pocket, but there being a hole in it, he lost 96 nuts; how many had he remaining?

45. On an apple-tree there were 154 apples, the wind blew off two dozen and a half; how many were left?

46. A draper bought 4786 yards of cloth, and sold 3987 yards; how many yards has he unsold?

47. What sum added to sixty-five thousand seven hundred and ninety-six, will make one million four hundred and fifty-two thousand three hundred and thirteen?

48. I was born in the year 1828; how old shall I be in the year 1849?

49 Ireland is about 300 miles in length, and 170 miles in breadth; how much greater is the length than the breadth?

50. Ben Nevis in Scotland, the highest mountain in the British Islands, is 4350 feet above the level of the sea; the summit of Magillicuddy's Reeks, the highest point in Ireland, is 3610; what is the difference in height between these two mountains?

51. The Shannon, the largest river in the British Isles, has a course of about 170 miles. The Amazon, in South America, has a course of about 3000 miles. What is the difference in length of their course?

52. The diameter of the Sun is about 883246 miles; that of the Earth about 7912; what is the difference in the diameter of the Sun and Earth?

53. The surface of the earth is nearly 200 millions of square miles: of this it is probable that 60 millions are land how many more square miles of water than of land are there on the earth's surface?

54. The population of London in 1831, was 1,776,566. The population of Dublin is about 203,652; how many more people are there in London than in Dublin?

55. Mont Blanc, in Switzerland, is the highest mountain in Europe, being 15,680 feet above the level of the sea, Chimborazo, the highest mountain in America, is about 21,000 feet in height. What is the difference in height between these two mountains?

56. Coals were discovered at Newcastle A. D. 1234; how long is it from that time till the year 1836?

57. Since convicts were first sent to Botany Bay, it is now, viz. 1836, about 42 years; in what year were convicts first sent?

58. Sir Isaac Newton was born A. D. 1642, and died 1727; how old was he when he died?

59. Petersburgh was founded by Peter the Great, A. D. 1703; how long is it from that time till the year 1836?

60. The art of printing was discovered about the year 1449: how long is it from that time to the year 1836?

MIXED QUESTIONS.

1. Tom had 264 marbles: he gave 64 to James, 75 to William, and 42 to John; how many had he left?

2. A merchant had 4208 yards of cloth: on Monday he sold 148 yards, on Tuesday 97, on Wednesday 246, on Thursday 198, on Friday 864, on Saturday 497; how much cloth had he remaining?

3. Three regiments went to battle: in the first there were 968 soldiers, in the second 769, and in the third 847. There were 248 men killed in the first regiment, 368 in the second, and when the regiments returned there were only 436 men in the third; how many returned from the battle?

4. A man had a journey of 298 miles to make: the first day he walked 42 miles, the second 36 miles, the third 81 miles, the fourth 27 miles; how much farther had he to go?

5. Three vessels sailed to America with emigrants: in the first vessel there were 126 men, 96 women, and 42 children; in the second vessel there were 98 men, 87 women, and 26 children; in the third vessel there were 43 men, 24 women, and 8 children. In the first vessel three persons died; in the second two were washed overboard; the third vessel was wrecked, and all on board perished: how many got safe to America?

6. A little boy went to the Zoological Gardens to see the animals: he laid his hat on the ground, which contained 264 nuts. While his attention was engaged, the monkey stole 27 of his nuts; while he was pursuing the monkey, a squirrel made off with 16 more: how many had he remaining?

7. The population of Cork is about 108,000; of Belfast 55,000; of Liverpool 166,000; of Glasgow 203,000; by how much does the population of London exceed all these cities the population of it being 1,776,556 in the year 1851?

8 Received on Monday £247; paid away on Tuesday £196; received on Wednesday £349, paid away on Thursday £402; received on Friday £687; paid away on Saturday £296; what money had I still remaining?

SIMPLE MULTIPLICATION.

Multiplication teaches us to find what a number will amount to, when it is repeated a number of times.

CASE I.—*When the Multiplier does not exceed* 12.

Multiply 53 by 7.

53 7 371

RULE WITH EXAMPLE.—Place the number by which you are to multiply under the number to be multiplied; then say, 7 times 3 make 21. Put down the 1 under the 7. Then 7 times 5 make 35, and the 2 of the 21 make 37. Put down the 37. The 53 is called the *Multiplicand;* the 7 is called the *Multiplier;* and the 371 is called the *Product.* The multiplicand and the multiplier taken together are called the *Factors;* thus 53 and 7 are factors.

EXERCISES.

659 2 1318	427 2 854	642 2 1284	748 2 1496	396 2 792
486 3	968 3	687 4	983 4	758 5
806 5 4480	793 6 4758	378 7 2646	596 8 4768	974 9 8766
742 10	856 11	597 12	903 6	609 8

(1)	(2)	(3)	(4)
4276 4	67287 9	86453 5	75268 8

(5)	(6)	(7)	(8)
9468	84076	43256	74879
7	8	9	10

(9)	(10)	(11)	(12)
45687	96854	68875	47389
11	12	9	12

13. Multiply 87546 by 4
14. — 7
15. — 9
16. — 6
17. — 3
18. — 5
19. — 10
20. — 11
21. — 12
22. Multiply 98327 by 2
23. — 7
24. — 4
25. — 8
26. — 6
27. — 5
28. — 9
29. — 12
30. — 11

Case II.—*When the Multiplier is a Composite Number.**

Multiply 436 by 32.

Rule with Example.—The multiplier, viz. 32, is formed by the two factors 4 and 8; therefore instead of multiplying by 32, you may multiply by 4, and obtain the product 1744 Multiply this product by the other factor, 8, and you obtain 13952 the product of the 436 multiplied by 32.

```
  436
    4
 ----
 1744
    8
-----
13952
```

31. 426478 × 16
32. 743657 × 18
33. 968748 × 24
34. 674867 × 27
35. 642067 × 36
36. 426456 × 49
37. 365745 × 54
38. 240576 × 56
39. 784978 × 72
40. 204074 × 105
41. 430576 × 132
42. 496576 × 144

---

* A composite number is the product of two factors; thus 16 is a composite number, because formed of the factors 2 and 8, or 4 and 4; 21 is formed of 3 and 7; 27 of 3 and 9; 36 of 4 and 9, or 6 and 6, or 3 and 12

CASE II.—*When the Multiplier contains several figures*

Multiply 3426 by 342.

RULE WITH EXAMPLE.—Place the multiplier under the multiplicand, units under units, &c. Multiply by the unit figure of the multiplier, viz. 2. Then multiply by the next figure of the multiplier, viz. 4; thus, 4 times 6 make 24; but take notice that you are to place the 4 of the 24 directly under that figure of the multiplier by which you are multiplying. Proceed in the same manner with the figure 3 of the multiplier. Then add together the products obtained.

```
   3426
    342
   ----
   6852
  13704
 10278
-------
1171692
```

Multiply 6487 by 230.

```
    230
 ------
 194610
12974
-------
1492010
```

Multiply 6487 by 203

```
    203
  -----
  19461
129740
-------
1316861
```

43. Mult. 98476 by 642
44. — 758
45. — 295
46. — 496
47. — 857
48. — 4368
49. — 7896
50. — 2654
51. Mult. 65839 by 958
52. — 627
53. — 369
54. — 426
55. — 704
56. — 8743
57. -- 6007
58. — 9864

59. Multiply sixty-four thousand eight hundred and fifty two, by nine hundred and eighty-seven.

60. Multiply four hundred and fifty-eight thousand six hundred and ninety-four, by eight thousand and seventy-six.

61. Multiply nine hundred and eighty-six thousand seven hundred and forty, by four hundred and nine

62. There are 8766 hours in the year; how many hours are there in 20 years?

63. A grocer sells goods to the amount of £56 per week how much does he sell during the year?

64. In a flock of 648 sheep, how many feet were there

65. Suppose the page of a book to contain 49 lines, and each line 47 letters, how many letters does the whole page contain?

66. In 264 dozen of wine, how many bottles are there?

67. A gentleman dying gave orders in his will that his fortune should be equally divided among his five children; each received £648: how much money did he leave?

68. Suppose that there were in the parish 896 houses, and that each house in the parish contained five persons, what would be the population of that parish?

69. A father has five children: their food and clothing cost him two pence each day; how many pence each does the support of the children come to in the year?

70. There were in a garden eight trees, and upon each tree there were 268 apples; how many apples were there upon all the trees?

71. There were 4768 geese plucked, and 17 quills got from each goose; how many quills were got from all?

72 There were 27 desks to be made for the school, and each desk required 29 nails; how many nails were required for all the desks?

73. In a school there were six windows in the boys room, and four in the girls' room: in each window there were eight panes of glass; how many panes of glass were there in all?

74. I knew two boys: one of them was lazy, and lay in bed till nine; the other was an active little fellow, who rose every morning at six; how many hours did the active boy gain in a year that the other lost?

75. How often does a clock strike in a year, at the rate of 156 times a day?

76. How many pins may a boy point in 6 days, who works 8 hours a day, and points 16,000 pins in an hour?

77. A gentleman bought an estate containing 5905 acres, at the rate of £26 per acre; how much did he pay for the estate?

78. How many miles will a person travel in 84 years supposing he travels 9 miles per day, and there are 365 days in the year?

SIMPLE DIVISION.

Division is the method of finding how often one number is contained in another.

Case I.—*When the Divisor does not exceed* 12.

Divide 252 by 6.

Rule with Example.—Put the numbers down according to the annexed example. Find how often the figure by which you are to divide, viz. 6, is contained in the first, or first and second figures; thus, 6 in 2, there are none; then 6 in 25; there are 4 sixes in 25 and 1 over. Put down the 4 under the 5. Suppose the 1 placed before the 2, which would make it 12. Say 6 in 12. There are 2 sixes in 12. Put the 2 under the 2. The number 6 is called the *Divisor;* 252 the *Dividend;* and 42 the *Quotient.*

6)252
42

EXERCISES.

2)4628 2314 | 2)6824 3412 | 3)6039 2013 | 4)8408 2102

2)47658 23829 | 3)76389 25463 | 4)85736 21434 | 6)76590 12765

(1) 4)27645 | (2) 5)68764 | (3) 6)79687 | (4) 7)80620

(5) 8)76426 | (6) 9)28676 | (7) 10)64268 | (8) 11)46267

(9) 12)76426872 | (10) 8)42687642 | (11) 7)96402687

(12) 9)64265762

(13) 12)46876876

(14) 8)46876400

(15) 6)76002041

(16) 9)4802601

(17) 7)41260602

18. Divide 56472689 by 2
19. —— — 3
20. —— — 4
21. —— — 5
22. —— — 6
23. —— — 7
24. —— — 8
25. —— — 9
26. —— — 10
27. —— — 11
28. —— — 12

29. Divide 74968928 by 2
30. —— — 3
31. —— — 4
32. —— — 5
33. —— — 6
34. —— — 7
35. —— — 8
36. —— — 9
37. —— — 10
38. —— — 11
39. —— — 12

CASE II.—*When the Divisor is a Composite Number.*

Divide 6789 by 28.

$$28\left\{\begin{array}{l}4)\underline{6789}\\7)\underline{1697}\text{ remains }1\\\quad 242\text{ remains }3\end{array}\right.$$

RULE WITH EXAMPLE.—The two factors that produce 28 are 4 and 7; divide them by 4 and by 7, as in the example. The quotient found is 242, but with two remainders, viz. 3 and 1. To obtain the complete remainder, multiply the first divisor, viz. 4, by the last remainder, viz. 3, and to the product add the first remainder, viz. 1; thus, 4×3+1 =13, the true remainder.

40. 426478 ÷ 16
41. 748587 ÷ 15
42. 985745 ÷ 24
43. 674567 ÷ 27
44. 642 67 ÷ 36
45. 489156 ÷ 49

46. 865745 ÷ 54
47. 246876 ÷ 56
48. 784979 ÷ 72
49. 204076 ÷ 108
50. 486876 ÷ 132
51. 498576 ÷ 144

CASE III.—*When the Divisor contains several figures.*

Divide 431769 by 528.

```
528)4317,69(817 quotient.
    4224
    ----
     936
     528
     ----
     4089
     3696
     ----
      393 remainder.
```

RULE WITH EXAMPLE.*—Put down the sum in this form. Consider whether the divisor, viz. 528, is contained in the first three figures of the dividend, viz. 431: you see at once that it is not; mark off then four figures, viz. 4317. You are now to find how often 528 is contained in 4317: for this purpose, find how often the first figure of the divisor, viz. 5, is contained in the first two figures of the dividend, viz. 43. It is contained 8 times; put the 8 on the opposite side of the dividend from the divisor. Multiply 528 by 8, and put the product under the 4317; subtract, and there remains 93; bring to this the next figure of the dividend, viz. 6 You are now to find how often the divisor, 528, is contained in your new dividend, 936; find, as you did before, how often the first figure of the divisor, 5, is contained in the first figure of the dividend, 9. It is contained once; put the 1 beside the 8: multiply 528 by 1, and place the product under the 936; subtract, and you obtain 408; bring to this the next figure of the dividend, 9. Find, as before, how often 528 is contained in 4089. Because 5 is contained 8 times in 40, you will be inclined to try 8. Do it, and you will find that you obtain the product 4224; but this is greater than the 4089, from which you have to subtract it: when this is the case, you must try a smaller figure; in this case take 7.

52. Divide 74236 by 42
53. —— 43
54. —— 44
55. —— 45

56. Divide 74236 by 46
57. —— 689
58. —— 799
59. —— 410

---

* This is rather a difficult rule to understand, and I think your teacher could explain it to you, by means of a blackboard and a bit of chalk, much better than I can hope to do by any written explanation; yet, if you pay attention, I shall do my best to make you understand it.

60. Divide 87408 by 611
61. —— 812
62. —— 584
63. —— 708
64. —— 246
65. —— 857
66. —— 428
67. —— 502
68. —— 615
69. —— 736
70. —— 418
71. —— 164
72. —— 857
73. —— 521
74. —— 403
75. —— 684

76. 842756 ÷ 76
77. 976842 ÷ 946
78. 4201076 ÷ 438
79. 6416879 ÷ 649
80. 2864976 ÷ 896
81. 2576407 ÷ 4107
82. 6412950 ÷ 7481
83. 9890147 ÷ 8076
84. 4078045 ÷ 4271
85. 7198641 ÷ 2864
86. 8641201 ÷ 1407
87. 2480768 ÷ 2600
88. 7864126 ÷ 7410
89. 3002602 ÷ 8000
90. 4920264 ÷ 9600
91. 9687600 ÷ 4300

92. Divide six millions seven hundred and ninety-four thousand, by four hundred and eighty thousand six hundred and nine.

93. Divide £79645 among 274 persons.

94. What is the ninth of £6037 ?

95. A ship sailed in four weeks 1202 miles ; how much is that per day ?

96. If a vessel contains 648 gallons of water, how long will it take to discharge it all, at the rate of 18 gallons an hour ?

97. The population of Ireland is about eight millions, and there are about 30,000 square miles of surface ; how many persons to each mile ?

98. The earth is about 95 millions of miles distant from the sun ; how many days would a horse take in reaching the sun, supposing he went at the rate of 45 miles per day ?

99. The rays of light come from the sun to the earth in 8¼ minutes, or 495 seconds ; at what rate does light move per second, the distance from the sun to the earth being 95173000 miles ?

100. The circumference of the earth is about 25000 miles, how long would a man take to walk round it at the rate of 27 miles per day ?

COMPOUND ADDITION.

Add together the following sums of money: £64 12*s.* 4¼*d.*, £86 15*s.* 6½*d.*, £14 16*s.* 5¾*d.*, £34 17*s.* 9¾*d.*

Rule with Example.—Place pounds under pounds, shillings under shillings, &c., and draw a line under the row of figures: first add the farthings together; thus, 3 farthings and 3 farthings make 6 farthings, 6 and 2 make 8, and 1 makes 9; but are equal to 2¼. Put the ¼ under the farthings, and add the 2 pence to the pence column. Then 2 pence and 9 pence make 11, and 5 make 16, and 6 make 22, and 4 make 26; but 26 pence are equal to 2 shillings and 2 pence. Put the 2 pence under the pence column, and add the 2 shillings to the shilling column; then 2 shillings and 7 shillings make 9, and 6 make 15, and 5 make 20, and 2 make 22; now come down the column adding the tens, 22 and 10 (of the 12) make 32, and 10 (of the 15) make 42, and 10 make 52, and 10 make 62. 62 shillings are equal to 3 pounds 2 shillings; set the 2 shillings under the shilling column, and carry the 3 pounds to the pound column. Proceed as in Simple Addition. The principles on which the operation depend are the same as for Simple Addition; only that the columns here do not differ from each other in a tenfold degree.

£	*s.*	*d.*
64	12	4¼
86	15	6½
14	16	5¾
34	17	9¾
201	2	2¼

EXERCISES.

£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
42	14	6¼	64	12	7	12	16	4¾
26	12	4½	36	18	4½	16	4	6¼
84	16	7	27	14	2¼	64	17	2¾
25	13	8¾	42	11	10½	43	12	7½
129	17	2½	171	17	0¼	137	10	9¼

(1)			(2)			(3)		
43	16	7¾	65	12	4	86	13	4½
65	13	4	72	17	6¾	12	8	6¼
84	12	2½	13	8	7½	11	19	10½
92	11	3	16	14	8¼	17	14	8¾
41	16	6¾	72	12	4½	28	12	6¼

(4)	(5)	(6)
462 16 2	684 14 0½	732 12 7¼
785 17 6¼	273 0 4	416 17 2
696 18 8½	856 12 6¾	178 0 4½
846 14 7¼	876 13 7½	423 4 0¾
765 12 4	842 15 4¼	146 16 10¼
846 7 9¾	687 17 7¾	876 19 6½

(7)	(8)	(9)
623 16 4¼	264 16 6	560 16 9¼
846 14 6	146 17 8½	208 14 4
764 12 7½	869 19 7¼	378 12 8¾
276 11 4	796 18 0	924 17 1
876 10 5¾	210 6 4	623 9 4
728 4 10	407 2 2¾	146 16 7½
473 16 11¼	864 17 6½	876 11 10¾

(10)	(11)	(12)
563 17 6¼	726 16 4½	143 14 4
786 14 4	894 17 6½	402 16 7½
249 16 1	107 14 5½	156 17 0¾
304 13 6¾	645 12 10¾	876 18 6½
160 14 2½	346 16 7	130 14 1
746 0 8½	568 7 1¾	679 11 4¼
876 7 1	725 16 0½	846 10 3½
416 19 10¾	268 10 6¼	765 16 5¾

(13)

	s.	d.
A pair of gloves........	2	6
—— of stockings	3	4
—— of shoes..........	9	6

(14)

	s.	d
A coat	14	0
Waistcoat...............	5	4½
Hat................	10	0

(15)

	£	s.	d.
For paving yard	4	7	0
— new-laying floor	2	5	6
1000 bricks	1	16	0
For mortar	0	14	6
— hair	0	2	6

(16)

	£	s.	d.
40 copy-books	1	4	0
100 slates	0	10	6
100 slate pencils	0	0	8
8 qrs. of paper	0	9	4
500 quills	0	7	7

17. A merchant, the first year he was in business, sold goods to the amount of 476*l.* 18*s.* 7*d.*; the second year, 678*l.* 14*s.* 6½*d.*; the third year, 878*l.* 7*s.* 0¾*d.*; the fourth year, 917*l.* 18*s.* 7*d.*; the fifth year, 1312*l.* 19*s.* 8¾*d.*: what was the amount of goods sold during the five years?

18. Bought a quantity of goods, for which I paid 496*l.* 16*s.* 6*d.*; besides this, I paid for packing 6*s.* 8*d.*; for case 16*s.* 6*d.*; for cord 1*s.* 6*d.*; for porterage 4*s.*; for freight 4*l.* 11*s.* 6*d.*; carriage by wagon 13*s.*; for booking 9*d.*: how much did I pay for the goods altogether?

19. A merchant purchased goods to the amount of 1468*l.* 16*s.* 7*d.*; he paid freight 27*l.* 7*s.* 6*d.*; other charges 23*l.* 14*s.* 7½*d.*; and he gained by the sale of the goods 348*l.* 19*s.* 6½*d.*: how much did he sell the goods for?

20. The expenses of building a house were as follows: architect 198*l.*; bricklayer 4762*l.*; mason 2141*l.* 16*s.* 6*d.*; carpenter 2768*l.* 17*s.* 9*d.*; plumber 896*l.* 14*s.*; glazier 478*l.* 16*s.* 6*d.*; painter 421*l.* 18*s.* 11½*d.*; and paper-hanger 243*l.* 18*s.* 7*d.*: what was the amount?

21. A merchant owes the following sums: at Liverpool 642*l.* 16*s.*; at Amsterdam 1426*l.* 18*s.* 6*d.*; at Madrid 2406*l.* 19*s.*; at Constantinople 897*l.*; at Copenhagen 786*l.* 16*s.* 8*d.*; at Lisbon, 2704*l.* 17*s.* 8½*d.*; at Dresden 786*l.* 14*s.*. what was the gross amount of his debts?

22. A person went to market, and laid out on the purchase of tea 2*l.* 16*s.* 7*d.*; on coffee 2*l.* 7*s.* 8¾*d.*; on sugar 3*l.* 14*s.*; on beef 2*l.* 16*s.* 6*d.*; on mutton 37*s.*; on veal 9*s.* 7½*d.*; on various other articles 3*l.* 15*s.* 7¾*d.*: how much was laid out in all?

COMPOUND SUBTRACTION.

From £64 12*s.* 6½*d.*, take £27 18*s.* 8¾*d.*

£	*s.*	*d.*
64	12	6½
27	18	8¾
36	13	9¾

RULE WITH EXAMPLE.—Place the smaller number under the greater, as in Simple Subtraction. Then, 3 farthings from 2 farthings, cannot; add 4 farthings (=1 penny) to the 2, and 3 farthings from 6, there remain 3; place the ¾ under the farthings. Add 1 to the 8; then 9 pence from 6 pence, cannot; add 12 pence (=1 shilling) to the 6; then 9 from 18, there remain 9; put the 9 pence under the pence. Add 1 to the 18; then 19 shillings from 12, cannot; add 20 shillings (=1 pound) to the 12; then 19 from 32, there remain 13; place the 13 under the shillings. Carry 1 to the 7, and proceed as in Simple Subtraction.

EXERCISES.

£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
49	17	4½	64	8	3¼	73	10	5½
17	14	2¼	27	16	7½	48	18	9¾
32	3	2¼	36	11	7¾	24	11	7¾

(1)			(2)			(3)		
78	14	6¼	47	16	8½	86	17	4
29	17	8½	28	17	6¼	27	19	0¾

(4)			(5)			(6)		
68	13	7	94	0	0	83	17	9½
25	16	0¼	24	17	9½	47	0	0¾

(7)			(8)			(9)		
68	18	8¼	17	6	7	20	11	11¼
7	19	8¾	0	19	11¼	1	17	11½

(10)			(11)			(12)		
56	12	0½	24	19	8½	48	12	8
17	12	0¾	7	12	9	17	19	8¼

13. From 4298*l.* 16*s.* 6½*d.*, take 1490*l.* 19*s.* 8¾*d.*

14. Take 2704*l.* 19*s.* 8½*d.*, from 17024*l.* 18*s.* 0*d.*

15. How much will remain of 4968*l.* if you take away 1467*l.* 9*s.* 16¼*d.*?

16. I lent John 2046*l.* 15*s.* 0*d.*: he has paid me 1276*l.* 14*s.* 9*d.*; how much does he still owe me?

17. A person was sent to the bank to receive 467*l.*: in returning he lost two fifty-pound notes, and three ten-pound notes; how much had he remaining?

18. There were two houses worth 246*l.* 18*s.* 0*d.*: one of them was sold for 121*l.* 16*s.* 6*d.*; what was the value of the other house?

19. A cow and calf were worth 16*l.* 7*s.* 10½*d.*; but the calf alone was worth 2*l.* 6s. 7¾*d.*: can you tell me the value of the cow?

20. A farmer owed 164*l.* 10*s.* 0*d.*: he gave to his creditors a horse worth 24*l.*, a cow worth 16*l.* 14*s.* 6*d.*, and a plough worth 13*l.* 16*s.*; how much was still due?

21. Bought a quantity of goods for 1426*l.* 16*s.*: sold them for 1537*l.* 18*s.* 6½*d.*; what was the profit?

22. A vessel, with its cargo, was worth fifty-six thousand four hundred and thirty-nine pounds; the cargo was worth thirty-four thousand nine hundred and nine pounds, eight shillings and six pence: what was the value of the ship?

23. A tradesman borrowed 1243*l.*: in January he paid 236*l.* 15*s.*, in April 197*l.* 12*s.* 6*d.*, in August 349*l.* 18*s.* 8*d.*, and in December 283*l.*; how much does he yet owe?

24. A young man had in the Savings Bank 124*l.* 10*s.* 6*d.* Being sick and unable to work he drew out 8*l.* 4*s.* 8*d.* After this he went into business, and laid out in the purchase of stock 42*l.* 16*s.* 6d.; and for fixtures 14*l.* 18*s.*; what sum had he still in the bank?

25. A merchant has in cash 568*l.* 17*s.* 6*d.*; goods valued at 4794*l.* 18*s.*; a house worth 809*l.*; a ship worth 894*l.*; debts due to him 749*l.* 16*s.* 9¾*d.* He owes for goods 2475*l.* 16*s.*; an architect 374*l.* 19*s.*; and various other sums that amount to 798*l.* 17*s.* 9½*d.*; what is his net stock?

COMPOUND MULTIPLICATION.

CASE I.—*When the Multiplier does not exceed* 12.

Multiply £6 12*s.* 4½*d.* by 7.

RULE WITH EXAMPLE.—Begin multiplying the farthings by 7. Thus, 7 times ½ are 3½; set down ½ and carry 3 to the pence; 7 times 4*d.* are 2*s.* 4*d.*, and 3 carried are 2*s.* 7*d.*; set down 7 under the pence and carry 2; 7 times 12 are 84, and 2 carried are 86*s.*, which is equal to 4*l.* 6*s.*; set down the 6 under the shillings, and carry 4; 7 times 6 are 42 and 4 carried make 46*l.* Place it under the pounds.

$$\begin{array}{rrr} £ & s. & d. \\ 6 & 12 & 4\frac{1}{2} \\ & & 7 \\ \hline 46 & 6 & 7\frac{1}{2} \end{array}$$

EXERCISES.

$$\begin{array}{rrr} £ & s. & d. \\ 64 & 7 & 4\frac{1}{4} \\ & & 2 \\ \hline 128 & 14 & 8\frac{1}{2} \end{array} \qquad \begin{array}{rrr} £ & s. & d. \\ 43 & 12 & 6\frac{1}{2} \\ & & 3 \\ \hline 130 & 17 & 7\frac{1}{2} \end{array} \qquad \begin{array}{rrr} £ & s. & d. \\ 57 & 16 & 8\frac{3}{4} \\ & & 4 \\ \hline 231 & 6 & 11 \end{array}$$

$$\begin{array}{c} (1) \\ \begin{array}{rrr} 79 & 18 & 4\frac{1}{4} \\ & & 5 \\ \hline \end{array} \end{array} \qquad \begin{array}{c} (2) \\ \begin{array}{rrr} 68 & 14 & 9\frac{1}{4} \\ & & 6 \\ \hline \end{array} \end{array} \qquad \begin{array}{c} (3) \\ \begin{array}{rrr} 43 & 14 & 7\frac{1}{2} \\ & & 7 \\ \hline \end{array} \end{array}$$

$$\begin{array}{c} (4) \\ \begin{array}{rrr} 67 & 17 & 11\frac{1}{2} \\ & & 8 \\ \hline \end{array} \end{array} \qquad \begin{array}{c} (5) \\ \begin{array}{rrr} 14 & 0 & 6\frac{3}{4} \\ & & 9 \\ \hline \end{array} \end{array} \qquad \begin{array}{c} (6) \\ \begin{array}{rrr} 87 & 12 & 4\frac{1}{2} \\ & & 10 \\ \hline \end{array} \end{array}$$

$$\begin{array}{c} (7) \\ \begin{array}{rrr} 78 & 16 & 7\frac{3}{4} \\ & & 11 \\ \hline \end{array} \end{array} \qquad \begin{array}{c} (8) \\ \begin{array}{rrr} 59 & 19 & 7\frac{1}{2} \\ & & 12 \\ \hline \end{array} \end{array} \qquad \begin{array}{c} (9) \\ \begin{array}{rrr} 67 & 16 & 10\frac{3}{4} \\ & & 9 \\ \hline \end{array} \end{array}$$

$$\begin{array}{c} (10) \\ \begin{array}{rrr} 68 & 10 & 11\frac{1}{4} \\ & & 8 \\ \hline \end{array} \end{array} \qquad \begin{array}{c} (11) \\ \begin{array}{rrr} 49 & 18 & 0\frac{3}{4} \\ & & 7 \\ \hline \end{array} \end{array} \qquad \begin{array}{c} (12) \\ \begin{array}{rrr} 89 & 1\text{[illegible]} & 6\text{[illegible]} \\ & & 6 \\ \hline \end{array} \end{array}$$

CASE II.—*When the Multiplier exceeds* 12.

Multiply £4 6*s*. 3*d*. by 23.

Rule with Example.—When the multiplier, viz. 23, is under a hundred, multiply the multiplicand, 4*l*. 6*s*. 3*d*., by *one* ten, and the product, 43*l*. 2*s*. 6*d*., by the number of tens, 2; then multiply the top line, viz. 4*l*. 6*s*. 3*d*., by the number of units, 3; add this to the amount obtained by multiplying by the number of tens, 2; and the sum required is obtained, viz. 99*l*. 3*s*. 9*d*.

£	*s*.	*d*.	
4	6	3	×3
		10	
43	2	6	
		2	
86	5	0	
12	18	9	
£99	3	9	

Multiply 4*l*. 6*s*. 3*d*. by 423. When the multiplier, 423, is a hundred, or above it, multiply the multiplicand, 4*l*. 6*s*. 3*d*., twice by 10, and the product, 431*l*. 5*s*., by the number of hundreds, 4; then multiply the product of the first 10, 43*l*. 2*s*. 6*d*., by the number of tens, 2; and place it under the product of the 4, under 1725*l*. 0*s*. 0*d*.: multiply now the first line, 4*l*. 6*s*. 3*d*., by the number of units, viz. 3; put the product obtained under the product of the tens, and add the products of the hundreds, the tens, and the units together for the answer.—For thousands multiply by four tens, and proceed in the same manner.

£	*s*.	*d*.	
4	6	3	×3
		10	
43	2	6	×2
		10	
431	5	0	
		4	
1725	0	0	
86	5	0	
12	18	9	
1824	3	9	

Multiply £6 12*s*. 4¼*d*. by 345.

£	*s*.	*d*.		
6	12	4¼	×5	
		10		
66	3	6½	×4	
		10		
661	15	5		
		3		
1985	6	3	=	300
264	14	2	=	40
33	1	9¼	=	5
2283	2	2¼		245

Multiply £7 8*s*. 5*d*. by 648.

£	*s*.	*d*.		
7	8	5	×8	
		10		
74	4	2	×4	
		10		
742	1	8		
		6		
4452	10	0	=	600
296	16	8	=	40
59	7	4	=	8
4808	14	0		648

		£	s.	d.					£	s.	d.		
13.	Mult.	64	16	7½	by	68	23.	Mult.	98	13	8¼	by	87
14.	—	86	13	4½		75	24.	—	42	16	7½		45
15.	—	69	12	6¼		93	25.	—	63	12	8¾		64
16.	—	648	19	7¾		68	26.	—	746	0	7¼		96
17.	—	367	16	4¼		246	27.	—	820	7	6½		263
18.	—	658	13	7		478	28.	—	763	16	0¾		403
19.	—	467	15	8¾		647	29.	—	278	9	11½		784
20.	—	675	0	4¼		608	30.	—	560	17	0¼		430
21.	—	568	12	0¾		785	31.	—	804	0	7		658
22.	—	807	14	6¼		680	32.	—	786	12	0¾		867

33. What do 4 lbs. of butter come to at 1*s.* 1*d.* per lb.?

34. What do 6 lbs. of tea come to at 5*s.* 3*d.* per lb.?

35. What do 7 gallons of spirits come to at 6*s.* 9*d.* per gallon?

36. Patrick gets 1*s.* 9*d.* per day; how much is that in 6 days?

37. A grocer bought 12 cwt. of sugar, for which he paid 8*l.* 9*s.* 7½*d.* per cwt.; how much did he pay in all?

38. I bought 8 dozen pair of gloves at 2*s.* 3*d.* per pair what did the whole cost me?

39. A farmer bought 12 cows: they cost him 9*l.* 12*s.* 6*d* each; how much did they all come to?

40. Bought 11 barrels of herrings at 1*l.* 8*s.* 7½*d.* each, what did the whole cost?

41. Sold eight oxen, and gained upon each 2*l.* 11*s.* 7½*d.*; how much did I gain?

42. Bought 11 loads of hay at 3*l.* 17*s.* 7*d*½. each load; how much did they come to?

43. A gentleman spends, per day, 1*l.* 7*s.* 6*d.*; how much does he spend in a year?

44. A farmer paid in rent 246*l.* 16*s.* 6*d.* every year; how much did he pay the landlord in the course of 25 years?

45. A carpenter received 14*s.* 6*d.* per week; what did his wages amount to in the year?

46. What is the value of 568 ounces of gold, at 3*l.* 10*s.* 6*d* per ounce?

47. A person spent 12*s.* 6*d.* per day, and found that at the end of the year he had saved 25 guineas; what was his annual income?

48. A farmer bought 568 sheep: he paid for them 1*l.* 12*s.* 6*d.* each; how much did the whole flock cost him?

CASE III.*—*To multiply by parts.*

Multiply 4*s.* 8½*d.* by 4½.

If the part be ¼, take a quarter of the multiplicand.
If the part be ½, take a half of the multiplicand.

If the part be ¾, take half and a quarter of the multiplicand, or divide the multiplicand by the under figure of the fraction, and multiply the product by the upper figure. Add the quotient thus obtained to the product obtained by multiplying the multiplicand by the whole number in the multiplier. This latter way applies to any fractional part.

	s.	*d.*	
	4	8½	
		4½	
	18	10	
	2	4¼	half of top line.
1	1	2¾	

Multiply £4 4*s.* 8*d.* by 4¾.

£	*s.*	*d.*	
4	4	8	
		4¾	
16	18	8	
2	2	4	=½ of top line. } =¾
1	1	2	=¼ of top line. }
20	2	2	

or

£	*s.*	*d.*	
4	4	8	
		4¾	
16	18	8	
3	3	6	=¾ of top line.
20	2	2	

49.	Mult.	4	2	6	by	4½
50.	—	7	16	7½		7¾
51.	—	28	19	8¾		9¼
52.	—	87	13	9½		12½
53.	—	874	12	10¾		10¾
54.	—	478	14	6½		11½
55.	Mult.	7	8	9½	by	7¼
56.	—	4	19	8½		9½
57.	—	48	17	6½		47½
58.	—	59	14	7¼		87⅕
59.	—	796	13	4⅓		49 3/7
60.	—	864	16	0¼		94⅜

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* Let the pupil omit Case III. until he understands Case I. of Compound Division.

COMPOUND DIVISION.

CASE I.—*When the Divisor does not exceed* 12.

Divide £8 12*s.* 7½*d.* by 6.

RULE WITH EXAMPLE.—Proceed thus: 6 in 8 once and 2 over; set down the 1 under the 8, and carry 40*s.* for the 2*l.* to the 12; then 6 in 52, 8 times and 4 over; set down the 8 and carry 48*d.* for the 4*s.* to the 7; then 6 in 55, 9 times and 1 over; set down the 9 and carry 4 farthings to the farthing; 4 and 2 are 6: 6 in 6 once; set down ¼.

	£	*s.*	*d.*
6)	8	12	7½
	1	8	9¼

EXERCISES.

2)	74	16	8½
	£37	8	4¼

3)	76	12	2¾
	£25	10	8¾—2

	£	*s.*	*d.*			£	*s.*	*d.*	
1. Divide	68	17	9¼	by 2	12. Divide	98	14	7¼	by 7
2.	42	12	3¼	3	13.	47	13	6½	8
3.	69	18	7¾	4	14.	67	19	1¼	9
4.	748	15	0½	5	15.	864	1	7¾	12
5.	176	19	10¾	6	16.	587	14	10½	6
6.	407	14	2½	7	17.	311	7	11¼	5
7.	8647	17	11¾	8	18.	4000	18	0½	10
8.	7508	13	6½	9	19.	8681	11	8½	12
9.	5060	0	7¼	10	20.	7010	18	0¼	9
10.	8687	18	11¾	11	21.	8671	2	11½	8
11.	4711	11	7½	12	22.	8762	17	0¾	12

23. A tradesman had in the savings bank 96*l.* 16*s.* 6*d.*; this sum he had saved in 5 years; how much did he save on an average each year?

24. Ten men rented a house at 46*l.* 14*s.* 8*d.*; how much had each to pay?

25. A father left 426*l.* 16*s.* 6*d.* to be divided equally among his eight children; how much did each get?

26. Twelve persons subscribed 28*l.* 15*s.* 6*d.* per annum, for the support of a school; how much did each subscribe?

27. A piece of cloth containing nine yards was bought for 4*l.* 16*s.* 8*d.*; how much was that per yard?

28. Bought nine dozen bottles of wine, for which I paid 13*l.* 17*s.* 9*d.*; what did I pay per dozen?

29. Nine vessels imported goods, valued at 79687*l.* 16*s.*, what was the average value of each cargo?

Case II.— *When the Divisor exceeds* 12.

Divide £64 7*s.* 8½*d.* by 47.

Rule with Example. — Divide the pounds as in simple long division. Multiply the remainder, 17, by 20, adding to it the shillings, 7. Divide again as in simple division. Multiply the remainder, 18, by 12, adding to it the pence, 8. Divide again as in simple division; multiply the remainder, 36, by 4, adding to it the farthings, and divide as before. The quotient then is 1*l.* 7*s.* 4¾*d.* with 5 of a remainder.

```
     £   s.  d.
 47)64   7   8½(1
    47
    --
    17
     20
   -----
 47)347(7
    329
    ---
     18
     12
    -----
  47)224(4
     188
     ---
      36
       4
    -----
  47)146(3
     141
     ---
       5 remain.
```

	£	s.	d.			£	s.	d.	
31. Divide	47	16	4½	by 28	39. Divide	69	16	7¾	by
32.	78	15	6¼	37	40.	97	13	6½	7
33.	487	19	7¾	146	41.	647	14	7¾	196
34.	798	17	0½	365	42.	870	0	6½	264
35.	980	7	6¼	478	43.	993	19	7¾	489
36.	6427	14	9¾	942	44.	7086	8	0½	785
37.	7063	[illegible]	11½	806	45.	9403	17	6¾	908
38.	4817	6	8¾	718	46.	7608	16	4½	759

CASE III.—*When the Divisor contains a fraction.*

Divide £24 4*s.* 6½*d.* by 2½.

RULE WITH EXAMPLE.—Multiply both the dividend and the divisor by the under figure of the fraction, 2, adding in the upper figure, 1, to the product of the divisor; and divide by short or long division as the case may require.

	£	s.	d.
2½)	24	4	6½
2			2
5)	48	9	1
	9	13	9¾ ⅕

	£	s.	d.	by		£	s.	d.	by
47. Divide	42	14	6½	3½	53. Divide	64	17	6½	4¾
48.	64	17	7¼	6¼	54.	87	14	2¾	9⅓
49.	97	18	8¾	7¾	55.	38	19	5¼	8⅖
50.	847	12	5½	47⅓	56.	789	0	6¾	78⅕
51.	948	17	6¾	76¾	57.	807	16	10¼	84¾
52.	408	0	10½	43⅖	58.	978	17	6¾	96¾

59. A farmer rents a farm at 596*l.* 16*s.* 6*d.* per annum; he wishes to lay past as much every week as may pay the rent: how much must he save each week?

60. A merchant gained 14687*l.* in 15 years; what was his average gain per year?

61. In a large town there were 4768 children educated by 56 teachers; how many pupils on an average to each teacher?

62. A manufacturer paid in wages each week 264*l.* 17*s.* 6*d.*; there were 321 workmen; how much did each man receive?

63. There are about eight hundred millions of people in the world, and it is thought that as many die in 32 years; how many die on an average in a year?

64. If so many die in a year, how many die in an hour, there being 8765 hours in a year?

65. A prize of 7257*l.* 3*s.* 6*d.* is to be divided equally among 500 sailors; what is each man's share?

66. A gentleman had an estate of 3468 acres, for which he received per annum 879*l.* 16*s.* 8*d.*; how much was it let for per acre?

67. A tax gatherer collected 747*l.* 15*s.* 6*d.* per month, the first six months of the year; and 547*l.* 17*s.* 8*d.* per month, the last six months of the year: how much did he collect daily on an average for the whole year?

68. In a savings bank in a village there was deposited 268*l.* 17*s.* 8*d.*; and there were 56 depositors, or people who had placed money in the bank: how much had each deposited on an average?

CASE IV.—*When the Divisor contains several denominations*

Divide £32 16*s.* 8*d.* by £7 8*s.* 4*d.*

RULE WITH EXAMPLE.—Bring both divisor and dividend to the same denomination, and proceed as in simple division. The answer will be of the denomination that the divisor and dividend have been reduced to.

```
 £  s. d.     £   s. d.
 7  8  4  )  32  16  8
20            20
---          ---
148          656
 12           12
----         ----
1780    )    7880(4d.
             7120
             ----
              760
                4
            --------
            )3040(¼.
             1780
            --------
             1260 rem.
```

		£	s.	d.		£	s.	d.
69.	Divide	764	16	9	by	364	14	7
70.	——	987	13	8¼	—	249	17	8¾
71.	——	847	10	0¼	—	24	19	7¾
72.	——	210	3	4½	—	120	16	0¾
73.	——	901	12	10¾	—	710	10	4¼
74.	——	7826	13	3¼	—	637	14	7
75.	——	9368	14	3¾	—	42	7	0¼
76.	——	2010	16	0½	—	760	13	8½
77.	——	8103	12	1¾	—	213	12	1¼
78	——	4100	0	0¼	—	891	14	3¼
	——	8368	13	7½	—	491	12	0¼

REDUCTION.

Reduction is the bringing of one denomination to another without altering its value.

Case I.—*To bring from a higher to a lower.*

Rule with Example.—Multiply by as many of the less as make one of the greater. Thus, to bring 2*l.* to shillings, multiply 2 by 20, because there are 20*s.* in a pound.

£2
20
40*s.*

Case II.—*To bring a lower to a higher.*

Rule with Example.—Divide by as many of the less as make one of the greater. Thus, to bring 40 shillings to pounds, divide by 20, because there are 20 shillings in a pound.

s.
2,0)4,0
£2

Bring £4 9*s.* 6½*d.* to farthings.

Multiply the 4 by 20, and add the 9*s.* to the product: this will give the number of shillings, 89*s.* Multiply then by 12, adding 6 pence; this will give the number of pence, 1074*d.* Multiply by 4, and add the two farthings to the product: this will give the number of farthings in 4*l.* 9*s.* 6½*d.*

£ *s.* *d.*
4 9 6½
20
89
12
1074
4
4298

Bring 4298 farthings to pounds.

Divide the farthings by 4; this will give 1074 pence and 2 farthings. Divide this by 12, and 89 shillings and sixpence is obtained. Divide by 20, and the quotient is 4 pounds 9 shillings. In all 4*l.* 9*s.* 6½*d.*

4)4298
12)1074–½
2,0)8,9 6
£4 9 6–½

EXERCISES.

1. How many farthings are there in 12*l.* 7*s.* 6½*d.*?
2. In 264*l.* 9*s.* 10*d.* how many pence?
3. Reduce 364*l.* 14*s.* 9½*d.* to farthings.
4. In 247*l.* 12*s.* 8½*d.* how many halfpence?
5. How many pence are there in 276 guineas?
6. In 298 crowns, how many farthings?
7. Reduce 3648 sixpences to farthings.
8. In 42768 farthings, how many pence?
9. How many pounds are there in 67890 shillings?
10. In 426876 farthings, how many pounds?
11. How many guineas are there in 37689 shillings?
12. In 68794 pence, how many crowns?
13. How many fourpences are there in 37689 shillings?
14. In 2470*l.* how many crowns?
15. How many pounds in 39076 half-crowns?
16. In 29685 twopences, how many shillings?
17. In 48687 crowns, how many threepences?
18. How many fivepences are there in 4796 crowns?
19. In 76971 halfpence, how many fourpences?
20. In 798302 pounds, how many sixpences?
21. How many crowns are there in 7968 guineas?
22. In 79201 half-guineas, how many seven-shilling pieces?
23. How many fivepences are there in 764 pounds?
24. In 73027 farthings, how many eightpences?
25. How many half-sovereigns are there in 7642 guineas?
26. Reduce 7632*l.* 17*s.* 0¾*d.* to farthings.
27. Reduce 3010*l.* 11*s.* 8*d.* to farthings.
28. In 7324 guineas, how many ninepences?
29. How often is three farthings contained in 742*l.* 17*s.* 9¾*d.*
30. In 7690 fourpences, how many fivepences?

WEIGHTS AND MEASURES.

EXERCISES

AVOIRDUPOIS WEIGHT.

ADDITION

cwt.	*qrs.*	*lbs.*
4	2	12
2	3	14
6	1	7
3	2	24
17	2	1

(1)

cwt.	*qrs.*	*lbs.*
7	3	16
8	1	19
4	2	27
8	1	13

(2)

qrs.	*lbs.*	*oz.*
1	14	13
2	24	15
3	18	7
2	17	13

SUBTRACTION.

cwt.	*qrs.*	*lbs.*
16	2	12
12	3	24
3	2	16

(3)

cwt.	*qrs.*	*lbs.*
17	1	10
10	2	27

(4)

qrs.	*lbs.*	*oz.*
19	22	12
11	26	14

MULTIPLICATION.

cwt.	*qrs.*	*lbs.*
4	3	16
		4
19	2	8

(5)

cwt.	*qrs.*	*lbs.*
6	2	18
		7

(6)

qrs.	*lbs.*	*oz.*
2	23	12
		9

DIVISION.

cwt.	*qrs.*	*lbs.*
3)19	3	8
6	2	12

(7)

cwt.	*qrs.*	*lbs.*
6)14	2	17

(3)

qrs.	*lbs.*	*oz.*
9)19	11	13

9. A tobacconist received 16 cwt. 2 qrs. 25 lb. of tobacco and sold 12 cwt. 3 qrs. 26 lb.; how much has he unsold?

10. A brewer bought five bags of hops: No. 1 weighed cwt. 2 qrs. 14 lb.; No. 2 weighed 1 cwt. 3 qrs. 24 lb.; No. weighed 1 cwt. 1 qr. 27 lb.; No. 4 weighed 1 cwt. 3 qrs 6 lb.; No. 5 weighed 2 cwt. 2 qrs. 25 lb.: what was th eight of the whole?

11. A grocer sold the first year he was in business 64 cwt. qrs. 26 lb. 14 oz. of sugar; the third year he was in busi- ess he sold eight times as much: how much did he sell in he third year?

12. Eight hogsheads contained 168 cwt. 3 qrs. 26 lb. of ugar; how much did each contain?

13. A plantation produced the first year 376 cwt. 2 qrs 6 lbs. of sugar; the second year 473 cwt. 1 qr. 9 lb. 15 oz.; he third year 698 cwt. 14 lb. 12 oz.; the fourth year 568 wt. 3 qrs. 13 oz.; the fifth year 737 cwt. 2 qrs. 13 lb. 10 oz. 3 drams: how much sugar was produced on the plantation n these five years?

14. A grocer bought 3 hhds. of sugar, each containing 4 wt. 1 qr. 13 lb. The first month he sold 2 cwt. 3 qrs. 14 lb. 3 oz.; the second month he sold 2 cwt. 2 qrs. 14 oz. 10 rams; the third month he sold 3 cwt. 1 qr. 11 lb. 15 rams: how much has he on hand?

15. What is the weight of 36 hhds. of tobacco, each hhd. veighing 5 cwt. 3 qrs. 14 lbs. 13 oz.?

16. Eleven pieces of iron weighed 4 tons 16 cwt. 3 qrs. ow much did each piece weigh?

17. Ten sacks of potatoes weighed 19 cwt. 3 qrs. 13 lb. 4 oz.; what was the weight of each sack?

18. How many parcels, each containing 4½ lbs., can be nade out of 2 cwt. 2 qrs. 23 lb.?

19. If 36 bags of cotton weighed 49 cwt. 3 qrs. 13 lb., how nuch did one weigh?

20. How many hogsheads of sugar, each containing 13 wt. 2 qrs. 14 lb., may be put on board a ship of 324 tons burden?

21. St. Paul's bell in London weighs 5 tons 2 cwt. 1 qr. 22 lb.; by how much does the great bell of Moscow exceed t, which weighs 198 tons 2 cwt. 1 qr.?

TROY WEIGHT.

MULTIPLICATION.

				(22)			(23)	
lbs.	oz.	dwt.	lbs.	oz.	dwt.	oz.	dwt.	grs.
18	6	14	24	3	12	43	5	14
		4			8			9
74	2	16						

DIVISION.

				(24)			(25)	
lbs.	oz.	dwt.	lbs.	oz.	dwt.	oz.	dwt.	grs.
2)17	7	14	4)67	8	17	7)43	16	23
8	9	17						

26. A silversmith made three dozen spoons, weighin
lb. 9 oz. 8 dwt.; a teapot, weighing 3 lb. 2 oz. 16 dwt.
grs.; two pair silver candlesticks, weighing 4 lb. 6 oz.
dwt.; a dozen silver forks, weighing 1 lb. 8 oz. 19 dwt.
grs.; what was the weight of all the articles?

27. Three dozen silver tablespoons weighed 5 lb. 9 o
dwt., while three dozen silver teaspoons weighed only 1
oz. 16 dwt. 18 grs.; what was the difference in weight

28. Sold eight silver teapots, each weighing 3 lb. 9 oz.
dwt. 13 grs.; how much did they all weigh?

29. A silversmith received 36 lb. 8 oz. 14 dwt. 16 grs.
silver to make 12 tankards; what would the weight of e
tankard be?

30. What is the weight of 36 ingots of silver, each in
weighing 2 lb. 10 oz. 15 dwt.?

31. 2 lb. 4 oz. 9 dwt. of gold cost 59*l*. 16*s*. 6*d*.; what
it cost per dwt.?

32. What is the weight of 3 dozen spoons each weigh
oz. 3 dwt. 19 grs.?

LONG MEASURE.

ADDITION.

			(33)			(34)		
ml.	*fur.*	*per.*	*fur.*	*per.*	*yd.*	*per.*	*yd.*	*ft.*
4	6	20	7	22	2	16	3	2
6	5	13	6	22	4	17	4	1
7	4	9	9	16	3	24	5	0
6	7	12	6	14	5	23	2	2
26	0	14						

SUBTRACTION.

			(35)			(36)		
ml.	*fur.*	*per.*	*fur.*	*per.*	*yd.*	*per.*	*yd.*	*ft.*
4	6	20	7	10	1	16	2	1
1	7	35	2	19	4	12	4	2
2	6	25						

37. A man rode 35 miles, 2 furlongs, 34 perches; walked 24 miles, 6 furlongs, 25 perches, 2 yards; then rode again 12 miles, 7 furlongs, 4 yards; then walked again 15 miles, 4 furlongs, 38 perches, 3 yards: what was the length of his journey?

38. A traveller walked on Monday 32 miles, 5 furlongs; on Tuesday he walked 27 miles, 7 furlongs, 35 perches: how much did his journey of Monday exceed that of Tuesday?

39. A mail-coach travelled at the rate of 7 miles, 5 furlongs, 25 perches per hour; how far would it go in 12 hours?

40. A surveyor who had 19 miles, 7 roods, 36 perches of road to keep in repair, appointed 12 men to the work; what length of road had each to attend to?

41. A man travelled in nine days 150 miles, 4 furlongs, 18 perches, 3 yards; how much did he travel per day on an average?

CLOTH MEASURE.

MULTIPLICATION.

yds.	qrs.	nls.
24	2	3
		4
98	3	0

(42)

yds.	qrs.	nls.
16	3	2
		7

(43)

yds.	qrs.	n
36	2	
		6

DIVISION

yds.	qrs.	nls.
4)25	3	2
6	1	3½

(44)

yds.	qrs.	nls.
7)64	2	3

(45)

yds.	qrs.	nls.
9)36	3	1

46. A tailor bought four pieces of cloth: in the first there were 27 yds. 2 qrs. 3 nls.; in the second, 39 yds. 2 qrs. 1 nl.; in the third, 32 yds. 3 qrs. 3 nls.; in the fourth, 47 yds. 3 qrs. 2 nls.: how much in all?

47. A tailor, from a piece of cloth containing 37 yds. 3 qrs. 2 nls., cut off 18 yds. 3 qrs. 2 nls.; how much remained?

48. A dozen weavers wove, each, 36 yds. 3 qrs. 3 nls. of cloth; how much was woven by the whole?

49. In nine pieces of cloth of equal length, there were 187 yds. 2 qrs. 3 nls.; how much in each piece?

50. A piece of cloth at 7*s.* 6*d.* per yard, cost 17*l.* 12*s.* 6*d.*; how many yards were there in it?

51. What is the difference in length of one web of cloth measuring 36 yds. 3 qrs. 3 nls., and two webs, each measuring 23 yds. 2 qrs. 2 nls.?

52. How many suits of clothes can be made from a piece containing 39 yds. 2 qrs. 3 nls.; each suit requiring 3 yds. 1 qr. 2 nls.?

SQUARE AND LAND MEASURE.

ADDITION.

			(53)			(54)		
ac.	*rd.*	*per.*	*ac.*	*rd.*	*per.*	*ac.*	*rd*	*pe.*
32	3	16	46	3	27	37	2	12
16	2	21	12	2	16	41	3	21
76	1	13	61	0	34	62	1	17
24	2	27	46	3	17	47	2	34
150	1	37						

SUBTRACTION.

			(55)			(56)		
ac.	*rd.*	*per.*	*ac.*	*rd.*	*per.*	*ac.*	*rd.*	*per.*
42	1	10	36	0	20	42	1	25
16	2	25	13	2	30	17	2	35
25	2	25						

57. I bought four fields: in the first there were 6 acres, 3 roods, 12 perches; in the second 7 acres, 2 roods; in the third 8 acres and 13 perches; in the fourth 5 acres, 2 roods, 36 perches: how much in all?

58. A farmer sowed with wheat, a field containing 18 acres, 2 roods, 25 perches; and another with oats, containing 19 acres, 3 roods, 34 perches: how much larger was one field than the other?

59. Eight men cut down a field of hay: each man cut 3 acres, 2 roods, 27 perches; how much was mown?

60. Twelve men ploughed a field containing 16 acres, 3 roods, 35 perches, how much did each plough?

61. In a field containing 241 acres, 3 roods, 16 perches; 176 acres, 2 roods, 25 perches, were sown with wheat; the remainder of the field was sown with barley: how much was sown with barley?

62. Bought 96 acres, 3 roods, 17 perches of land, for which I paid 1764*l.*; what did I pay for it per perch?

MEASURE OF CAPACITY.

MULTIPLICATION.

			(63)			(64)		
qrs.	*bush.*	*pk.*	*qrs.*	*bush.*	*pk.*	*qrs.*	*bush.*	*pk*
7	6	2	27	7	3	49	5	2
		3			7			3
23	3	2						

DIVISION.

			(65)			(66)		
qrs.	*bush.*	*pk.*	*qrs.*	*bush.*	*pk.*	*qrs.*	*bush.*	*pk*
2)9	7	2	4)43	6	3	9)78	7	2
4	7	3						

67. Sold to one man 27 qrs. 6 bushels, 3 pecks; to another 38 qrs. 4 bushels, 2 pecks; to another 49 qrs. 6 bushels; and to another 58 qrs. 7 bushels, 3 pecks: how much did I sell in all?

68. Lent a person 49 qrs. 2 bushels, 1 peck. I have received from him 32 qrs. 3 bushels, 3 pecks; how much does he still owe me?

69. John has 24 qrs. 3 bushels, 2 pecks; but Tom has 10 times as much: how much has he?

70. I received 248 qrs. 6 bushels, 3 pecks, and gave away a sixth part of it; how much did I give away?

71 What quantity of beer will be consumed in a year at the rate of 2 gallons, 3 quarts, 1 pint per day?

72. One cask contained 23 gallons, 3 quarts, 1 pint; another 37 gallons, 2 quarts, 3 gills: how much more did the one contain than the other?

73. Nine fields produced each on an average 24 loads, 4 quarters, 7 bushels, 3 pecks; how much was the produce of the nine fields?

74. In 27 barrels there was on an average in each, 29 gallons, 3 quarts, 1 pint: how much in all?

TIME.

ADDITION.

yrs.	*wks*	*dys.*
24	6	3
12	16	5
41	24	4
82	13	6
110	9	4

(75)

yrs.	*wks.*	*dys.*
27	36	4
43	12	4
74	43	6
27	18	5

(76)

dys.	*hrs.*	*min*
35	17	6
24	18	14
52	12	5
64	13	3

SUBTRACTION.

yrs.	*wks.*	*dys.*
43	4	2
24	6	5
18	49	4

(77)

yrs.	*wks.*	*dys.*
32	3	4
16	7	6

(78)

dys.	*hrs.*	*min.*
47	12	10
17	20	40

79. The bricklayers were engaged about a house 25 weeks, 4 days, and 8 hours; the carpenters, 14 weeks, 6 days, and 9 hours; the painters, 12 weeks, 5 days, 7 hours, and 34 minutes; the upholsterer, 5 weeks, 10 hours, and 42 minutes: how long were these different workmen engaged about the house?

80. Two vessels sailed for America: one of them was 9 weeks, 6 days, and 14 hours on the voyage; the other got to America in 7 weeks, 5 days, and 19 hours: how much less time did the one go in than the other?

81. I can go to a certain town by the railway in 9 hours, 25 minutes, and 30 seconds: it would take me, at least, five times as long to go by the stage-coach; how long would the coach take?

82. There are 365 days, 5 hours, 48 minutes, 57 seconds, in a solar year; how much is there in a twelfth of it?

83. How many seconds has a boy lived, who is 11 years old?

REDUCTION.

AVOIRDUPOIS WEIGHT.

1. In 7 cwt. 2 qrs. 14 lbs., how many pounds?

2. In 3 qrs. 13 lbs. 12 oz., how many ounces?

3. How many pounds are there in 1427 oz.?

4. Bought 24 bags of hops, each weighing 2 cwt. 2 qrs 13 lbs.; how many pounds in the whole?

5. In 3 cwt. 2 qrs. 14 lbs. of sugar, how many parcels are there, each containing half a pound?

TROY WEIGHT.

6. In 24 lbs. of gold, how many pennyweights?

7. In 2468 grains of gold dust, how many ounces?

8. In a silver snuff-box, weighing 10 oz. 16 dwt., how many grains?

9. How many silver tablespoons, each weighing 4 oz. 16 dwt., can be made out of 2 lbs. 8 oz. 13 dwt. of silver?

10. What quantity of gold will it require to make twelve gold ornaments, each weighing 1 oz. 18 dwt. 12 gr.?

11. A gentleman sent a silver tankard to a silversmith, and ordered him to make it into spoons, each to weigh 2 oz. 12 dwt.; how many spoons did he make, the tankard weighing 4 lbs. 7 oz.?

APOTHECARIES' WEIGHT.

12. In 4 lbs. 8 oz. 4 drs. 2 scr., how many grains?

13. In 2487 grains, how many ounces?

14. In 7 ounces, 5 drams, 3 scruples, how many scruples?

15. A patient is required to take daily 2 drams, 2 scruples of bark; how long will 7 lbs. of bark last him?

LONG MEASURE.

16. In 76 miles, 6 furlongs, how many perches ?

17. In 47968 inches, how many yards ?

18. From Dublin to Liverpool is about 38 leagues ; how nany yards is it ?

19. From Dublin to Cork is about 130 miles ; how often oes a coach-wheel turn round between the two places, the ircumference of the wheel being 12 feet ?

20. From Dublin to Belfast is about 90 miles ; how often oes a coach-wheel turn round between the two places, the ircumference of the wheel being 12 feet ?

CLOTH MEASURE.

21. In 246 yards, how many nails ?

22. In 4786 nails, how many yards ?

23. From a piece of linen containing 24 English ells, how any shirts can be made, each requiring 3½ yards ?

24. How many suits may be made from 26 yds. 2 qrs., ch suit containing 3½ yards ?

MEASURE OF CAPACITY.

25. In 24 gallons, 2 quarts, 1 pint, how many pints ?

26. In 4687 pints, how many gallons ?

27. In 24 loads, 5 bushels, 3 pecks, how many pecks ?

28. How many bushels are there in 4796 pecks ?

29. In a hogshead of wine containing 63 gallons, how ny gills are there ?

TIME.

30. In 6 weeks, 3 days, 14 hours, how many hours are ere ?

31. In 74697 minutes, how many days ?

32. How many minutes has a boy lived, who is 10 years d 6 weeks old ?

33. A clock strikes 156 times during the day ; how often es it strike in 6 years ?

SIMPLE PROPORTION.

When we have three numbers given, this r teaches how to find a fourth number, which m have the same proportion to the third number, th the second has to the first.

Thus, if the three given numbers be 1, 2, 3, it is requi to find a fourth number which will have the same prop tion to 3 that the 2 has to 1: now, the 2 is double the therefore, the required number must be double of the that is, 6. To express proportion, the numbers are put d thus: 1 : 2 : : 3 : 6, and are read thus, 1 is to 2 as 3 is to

Case I.—*To find out a fourth proportional to three g numbers.*

Find a fourth proportional to the numbers 4, 8, 6.

Rule with Example.—Place them thus, and multiply the second and third numbers, together, and divide by the first; the quotient is 12, which bears the same proportion to 6 that 8 does to 4.

$$\begin{array}{r} 4 : 8 : \\ 6 \\ 4\overline{)48} \\ \overline{12} \end{array}$$

	Ans
To 3, 6, 12, find a fourth proportional...........	24
To 6, 8, 3, find a fourth proportional...............	4
To 3, 6, 8, find a fourth proportional...............	16
To 6, 12, 4, find a fourth proportional	8
To 10, 150, 68, find a fourth proportional	1020
Find a fourth proportional to 1020, 68, 150	10
Find a fourth proportional to 150, 10, 1020......	68
Find a fourth proportional to 68, 1020, 10.......	150

Find a fourth proportional to the following numbers:—

	Ans
To 2 tons, 17 tons, and 25*l*......................	212*l*. 10*s*
To 10 lb., 150 lb., and 5*s*.......................	75*s*
To 9 yds., 36 yds., and 18*s*.......................	72*s*
To 5 lb., 1 lb., and 15*s*.	3*s*
To 4 yds., 18 yds., and 2*s*........................	9*s*
To 1 cwt., 215 cwt., and 50*s*.....................	10750*s*
To 5 tons, 50 tons, and 27*l*.	270*l*.

Case II.—*When the two first terms are of different denominations, reduce them to the same.*

To 3 oz., 112 lbs., and 2*s.*, find a fourth proportional.

Rule with Example.—Multiply the 12 lbs. by 16, to bring them to the same enomination as the first term, viz. to unces. When this is done, the numbers tand thus: 3 oz., 1792 oz., 2*s.*

```
oz.   lb.     s.
 3 : 112 :: 2 :
       16
      ---
      672
     112
     ----
     1792
        2
     ----
  3)3584
     ------
     1194,2
```

Find the fourth proportional to the following numbers :—

	Ans.
To 2 qrs., 240 yds., 12*s.*	5760*s.*
To 5*s.*, 80*l.*, 1 yd.	320 yds.
To 5 cwt., 6000 lbs., 8*s.*	85*s.* 400 remains.
To 5*s.* 6*d.*, 140*s.*, 2 yds.	50 yds. 60 remains.
To 3*s.* 4*d.*, 1*l.* 10*s.*, 1 yd.	9 yds.

Case III.—*When the third term is of a different denomination, reduce it to the lowest.*

To 2 lbs., 112 lbs., and 5*s.* 6*d.*, find a fourth proportional.

Rule with Example.—Multiply the s. by 12, adding the 6*d.* It then tands thus: 2 lbs., 112 lbs., 66*d.* Proeed as formerly.

```
lbs.  lbs.     s.  d.
 2 : 112 :: 5   6
       66   12
      ---   --
      672   66
     672
    ----
  2)7392
    ----
    3696 pence.
```

Find the fourth proportional to the following numbers :—

	Ans.
To 2 tons, 14 tons, 28*l.* 10*s.*	3990*s.*
To 5 brls., 100 brls., 18*s.* 6*d.*	4440*d.*
To 4 lbs., 112 lbs., 5¼*d.*	588 farthings.

If 24 lbs. of butter cost £1 8*s.*, what is the price of 3 lbs.

Rule with Example.—In this question there are two things mentioned—butter and money. Is the answer to the question to be given in butter or money? You see at once it is to be given in money. Put down the money, 1*l.* 8*s.*, for the third term. Having done this, you have now to consider where you are to place the 24 lbs. and the 3 lbs. Read over the question, and you will see that the answer must be less than the third term for 3 lbs. will not cost so much as 24 lbs. If, then, the answer is to be less, put the less number for the second term and the greater for the first. In all questions let the third term be the same as the answer; and if the answer is to be greater than the third term, put the *greater* second; if it is to be less, put the *less* second.

```
lbs.  lbs.      £   s.
24  :  3  : :   1   8
               20
               --
               28
                3
               --
     ( 2)84
  24 {   --
     (12)42
        -------
         3s. 6d.
```

1. If 2 lbs. of tea cost 9*s.*, what will 24 lbs. cost?

2. If 4 lbs. of coffee cost 8*s.* 8*d.*, what will 80 lbs. cost?

3. If 8 yds. of cloth cost 4*l.* 16*s.* 6*d.*, what will 74 yds. cost?

4. Bought 2 pair of boots for 1*l.* 18*s.* 8*d.*; what will 46 pair cost?

5. Bought 2 oz. of tea for 7¾*d.*; what is that per lb.?

6. Bought 15 lbs. of sugar for 9*s.* 10*d.*; what was the price per cwt.?

7. A person spends 2*l.* 16*s.* 8*d.* per week; how much is that per annum?

8. 3 qrs. 24 lbs. of sugar cost 4*l.* 16*s.* 8*d.*; how much is that per cwt.?

9. If 9*s.* 3½*d.* will buy 14 lbs. of sugar, how much will 9*s.* 6*d.* buy?

10. If 24 yds. cost 3*l.* 14*s.* 7*d.*, how much must I give for 1 yd. 3 qrs. 2 nls.?

11. What cost 5 hogsheads of sugar, each weighing 14 cwt. 2 qrs. 24 lbs., at 2*l.* 13*s.* 6*d.* per cwt.?

12. If for 7*s.* 8*d.* I can buy 9 lbs. of raisins, how much can I purchase for 56*l.* 16*s.*?

13. A bankrupt owes 4968*l.*; but he has only money suf icient to pay 9*s.* 7*d.* for every pound he owes: how much aoney has he to pay his debts?

14. A pole 6 feet high throws a shadow of 5 feet 8 inch s; what is the height of a spire which throws a shadow of 56 feet?

15. If 54 men can build a house in 90 days, how many aen would it require to do it in 12 days?

16. A grocer bought 6 cwt. 3 qrs. 26 lbs. of sugar, for hich he paid 24*l.* 16*s.* 8*d.*; at what rate per pound must e sell it to gain 4*l.* 10*s.* 4*d.* on the whole?

17. A person reaches a certain place in 18 days by walk ig 8 hours a day; what number of days would he have aken had he walked 12 hours a day?

18. If 14 men could make a ditch in 18 days, in what me could 34 men do it?

19. A ship was provisioned for a crew of 40 for 3 months; ow long would these provisions last, if the crew were re uced to 32 men?

20. If 8 horses can subsist on a certain quantity of hay r 2 months, how long would 12 horses subsist on the same uantity?

21. A field of corn was to be cut down by 40 men in 10 ays; 10 of the men, however, did not make their appear nce; in what time would the field be cut down?

22. If for 24*s.* I can have 1200 lbs. carried 36 miles, how any pounds can I have carried 24 miles for the same oney?

23. A tea dealer bought 4 chests of tea, each weighing lbs. 7 oz., for 63*l.* 14*s.* 6*d.*; what did the tea cost him per ince?

24. If 74 gallons of wine cost 52*l.* 17*s.* 9½*d.*, how much ill 16 gallons cost?

25. If 4 lbs. of tea cost 24*s.* 8*d.*, how much may be bought r 42*l.* 7*s.* 8*d.*?

26. If 3 cwt. 2 qrs. 16 lbs. of sugar cost 13*l.* 17*s.* 9*d.*, what the value of 19 cwt. 3 qrs. 14 lbs.?

COMPOUND PROPORTION.

When in order to find a fourth proportional, several circumstances require to be considered, it called Compound Proportion.

If 14 horses eat 56 bushels of oats in 16 days, how man bushels will be required for 20 horses for 24 days?

$$\begin{array}{lrcrl} & & & & \textit{bush.} \\ \text{horses} & 14 & : & 20 & :: 56 : \\ \text{days} & 16 & : & 24 & \\ \hline & 224 & & 480 & \\ & & & 56 & \\ \hline & & & 2880 & \\ & & & 2400 & \\ \hline & & 224) & 26880 & (120 \text{ bus} \\ & & & 224 & \\ \hline & & & 448 & \\ & & & 448 & \\ \hline & & & 0 & \end{array}$$

Rule with Example.—Write down for the third term that number which is of the same kind with the answer required —56 bushels. Then take two numbers of the same kind—14 horses and 20 horses—and consider, as in Simple Proportion, whether from the nature of the question, the greater or less is to be put in the first or second term. Here it is obvious that the greater must be in the second term, as 20 horses will eat more than 14 horses. Take the other two terms, and proceed in the same manner. After all the terms have bee put down, multiply the two first terms, 14 and 16, together do the same with the two second terms, 20 and 24, and proceed as in Simple Proportion.

Contraction.—Let the question be the same as in the last example.

$$\begin{array}{ccccc} & & & & 4 \\ 10 & & 3 & & \\ \cancel{20} & \times & \cancel{24} & \times & \cancel{56} \\ \hline \cancel{14} & \times & \cancel{16} & & \\ 2 & & 2 & & \end{array}$$

After the terms have been properly arranged, the operation may often be greatly shortened by using the following method: Draw a line, and place the first terms, 14 and 16, under it, and the second and third terms, 20, 24, and 56, above it; then divide any number above the line and any below by any number which will divide both without leaving remainder. Thus, 14 below and 56 above may both be divided by 7; divide by it, and place the figures obtained below and above the 14 and 56, drawing your pencil at the same time through the 14 and 56. Again, you see that 16 and 24 may be divided by 8; draw your pencil through them, and write the numbers above and below; then cancel the 20 and the 2; then the 8 and the other 2. Multiply all the figures that remain above the line, and divide the product by the product of all the figures under the line, if any, for the answer; thus, 10×3×4=120. This is the answer, as there are no figures below the line by which to divide.

1. If 15 men build 37 roods of wall in 27 days, how man roods will 74 men build in 63 days?

2 If 8 men for 5 days' work get 40s., how much ought 32 men to get for 24 days' work?

3. If 4 men can mow 20 acres of grass in 7 days, how many acres can 12 mow in 28 days?

4. If 6 tailors can make 10 suits of clothes in 4 days, how many suits can 20 make in 7 days?

5. A wall 28 feet in height was built in 15 days by 68 men; how many men working at the same rate could build a wall 32 feet high in 8 days?

6. If 12 horses in 5 days draw 44 tons of stones from a quarry, how many horses would it require to draw 132 tons in 18 days?

7. A garrison of 1500 men has provisions for 13 weeks, at the rate of 20 ounces per day to each man; how many men will the same provisions maintain for 20 weeks, allowing each man only 8 oz. per day?

8. If 50 men can do a piece of work in 100 days, working hours per day, in what time will 120 men do it, working hours per day?

9. What is the interest of 330*l.* 10*s.* for 2½ years, at 4½ per cent. per annum?

10. If 600*l.* gain 45*l.* in 18 months, how much will 108*l.* gain in 12 months?

BILLS OF PARCELS.

A bill is a written account of goods purchased, or work performed.

A Bill of Parcels is that which is delivered with the goods at the time of purchase.

BOOKSELLER'S BILL.

Mr. John Thompson

Bought of Curry & Co.

1836.
January 17.

	£	s.	d.
Cowper's Poetical Works	0	5	6
Bonnycastle's Algebra	0	7	0
Norie's Navigation	0	16	0
Plutarch's Lives, 6 vols.	2	12	6
Hutton's Mathematics, 3 vols.	1	11	6
Lardner's Arithmetic	0	6	0
	£		

HOSIER'S BILL.

Mrs. Young

Bought of Patrick Murphy

1836
Decem. 16.

		s.	d.		
5 Pair of Worsted Stockings,	at	3	8	per	pair,
Yards of Flannel,	"	1	9	"	yard,
4 Pair of Gloves,	"	2	6	"	pair
3 Pair Thread Stockings,	"	2	9	"	"
6 Pair Cotton do.	"	2	7	"	"
				£	

GROCER'S BILL.

Mrs. Young

Bought of John Dickson.

1836.
July 16.

		s.	d.	
12 lbs. of Loaf Sugar,	at	0	10	per lb.
9 lbs. of Green Tea,	"	12	0	"
6 lbs. of Turkey Coffee,	"	2	6	"
8 lbs. of Hyson Tea,	"	8	6	"
16 lbs. of Soft Sugar,	"	0	8	"
14 lbs. of Rice,	"	0	4	"
15 lbs. of Currants,	"	0	11	"
				£

BILLS OF BOOK DEBTS.

A Bill of Book Debts is a statement of debts formerly contracted. The following is the manner in which it ought to be copied from the tradesman's books :—

WINE MERCHANT'S BILL.

Mr. Thos. Robinson

To Wm. Anderson.

1836.				£	s.	d.	
May 24.	To 4 doz.	Port,	at	1	18	6	per doz.
" 28.	— 3½ "	Sherry,	"	1	16	0	"
June 13.	— 3 "	Claret,	"	2	18	0	"
July 19.	— 4½ "	Burgundy,	"	3	10	0	"
" 24.	— 1 "	Champagne,	"	3	18	0	"
Sept. 19.	— 4 gals.	Brandy,	"	1	2	0	per gal.
" 27.	— 3 "	Hollands,	"	1	1	0	"
							£

PRACTICE.

Practice is an abridged mode of performing operations in the rule of Simple Proportion; and is so named because it is much used by people in business.

A less number is said to be the aliquot part of a greater, when the less number is contained in the greater any number of times without leaving any remainder: thus, 3 is the aliquot part of 9 or of 15, and 4 of 16 or of 20.

TABLE OF ALIQUOT PARTS.

Of a pound.			*Of a pound.*		*Of a shilling.*	
s.	*d.*		*d.*		*d.*	
10	0	is $\frac{1}{2}$	10	is $\frac{1}{24}$	6	is $\frac{1}{2}$
6	8	– $\frac{1}{3}$	8	– $\frac{1}{30}$	4	– $\frac{1}{3}$
5	0	– $\frac{1}{4}$	7½	– $\frac{1}{32}$	3	– $\frac{1}{4}$
4	0	– $\frac{1}{5}$	6	– $\frac{1}{40}$	2	– $\frac{1}{6}$
3	4	– $\frac{1}{6}$	5	– $\frac{1}{48}$	1½	– $\frac{1}{8}$
2	6	– $\frac{1}{8}$	4	– $\frac{1}{60}$	1	– $\frac{1}{12}$
2	0	– $\frac{1}{10}$	3	– $\frac{1}{80}$	0¾	– $\frac{1}{16}$
1	8	– $\frac{1}{12}$	2	– $\frac{1}{120}$	0½	– $\frac{1}{24}$
1	4	– $\frac{1}{15}$	1½	– $\frac{1}{160}$	0¼	– $\frac{1}{48}$
1	3	$\frac{1}{16}$	1	– $\frac{1}{240}$		
1	0	$\frac{1}{20}$				

Of a ton.		*Of a cwt.*			*Of a quarter*	
cwt		*qrs.*	*lbs.*		*lbs.*	
10	is $\frac{1}{2}$	2	0	is $\frac{1}{2}$	14	is $\frac{1}{2}$
5	– $\frac{1}{4}$	1	0	– $\frac{1}{4}$	7	– $\frac{1}{4}$
4	– $\frac{1}{5}$	0	16	– $\frac{1}{7}$	4	– $\frac{1}{7}$
2½	– $\frac{1}{8}$	0	14	– $\frac{1}{8}$	3½	– $\frac{1}{8}$
2	– $\frac{1}{10}$	0	8	– $\frac{1}{14}$	2	– $\frac{1}{14}$
1	– $\frac{1}{20}$	0	7	– $\frac{1}{16}$	1	– $\frac{1}{28}$

CASE I.—*When the price is less than a penny.*

RULE.—Divide by the aliquot parts of a penny, as this ill give the answer in pence; divide them by 12 and by 0, to obtain the value in shillings and pounds.

What is the price of 4268 encils, at ½*d.* each?

½=½)4268
12)2134
2,0) 17,7–10
£8 17*s.* 10*d.*

What is the price of 4268 pencils, at ¾*d.* each?

½=½)4268
¼=½)2134
1067
12)3201
2,0)26,6–9
£13 6*s.* 9*d.*

1. What is the value of 6486 yds. of tape, at ¼*d.* a yd.?

2. How much will 3684 slate pencils come to, at ½*d.* each?

3. I bought 368 yards of black ribbon, at ¾*d.* per yard; hat did it cost me?

4. Bought 8 dozen of herrings at ½*d.* each; how much did give for the herrings?

5. How much did 428 yards of rope cost me, at ¾*d.* per ard?

CASE II.—*When the price is less than a shilling.*

RULE.—Take the aliquot parts of a shilling, and divide y 20.

What is the value of 4608 bs. of soap, at 3½*d.* per lb.?

d.
3=¼)4608
½=⅙)1152
192
2,0)134,4
£67 4*s.* *Ans.*

What is the value of 4608 lbs. of sugar, at 6½*d.* per lb.?

d.
6= ½)4608
½=$\frac{1}{12}$)2304
192
2,0)249,6
£124 16*s.* *Ans.*

6. What do 784 yds. of canvas come to, at 2¼*d.* per yd

7. Bought 856 yards of ribbon, for which I paid 8½*d.* p yard; how much did I pay?

8. Sold 1 cwt. of sugar at 9¾*d.* per lb.; how much w paid me?

9. Bought 7896 lbs. of candles for 5½*d.* per lb.; what d they cost me?

10. A fruiterer sold 3968 lbs. of raisins at 10¼*d.* per lb how much did he get for all?

11. 6423 at 1
12. 8684 — 1¼
13. 2786 — 1½
14. 5963 — 1¾
15. 4285 — 2
16. 6786 — 2¼
17. 4888 — 2½
18. 8653 — 2¾
19. 7568 at 3
20. 8543 — 3¾
21. 2758 — 4¼
22. 5623 — 4½
23. 4278 — 5¾
24. 6496 — 6½
25. 4378 — 6¾
26. 4021 — 7½
27. 8642 at 8
28. 7643 — 8
29. 8765 — 9
30. 2011 — 10
31. 4976 — 10
32. 3687 — 11
33. 2734 — 11
34. 3016 — 11

CASE III.—*When the price is shillings.*

RULE.—Multiply by the shillings, and divide by 20; or if the shillings be the aliquot part of a pound, divide by th aliquot part.

What is the price of 467 yds. of cloth, at 7*s.* per yd.?

$$\begin{array}{r} 467 \\ 7 \\ \hline 2{,}0)\overline{326{,}9} \\ \hline £163\ 9s.\ \textit{Ans.} \end{array}$$

How much do 684 lbs. o tea come to, at 8*s.* per lb.?

$$\begin{array}{r} 684 \\ 8 \\ \hline 2{,}0)\overline{547{,}2} \\ \hline £273,\ 12s.\ \textit{Ans.} \end{array}$$

What is the price of 246 yds. of cloth, at 10*s.* per yd.?

$$10s.=\tfrac{1}{2}\ )\underline{246} \qquad £123\ \textit{Ans.}$$

How much do 684 lbs. o tea come to, at 5*s.* per lb.?

$$5s.=\tfrac{1}{4}\ )\underline{684} \qquad £171\ \textit{Ans.}$$

When the price is an even number of shillings, the operation may be shortened by multiplying by half the number of shillings, and doubling the unit's place for shillings.

What is the price of 468 yards, at 8*s.* per yard?

yds.
468
4
£187 4*s.* *Ans*

What is the price of 967 yds. of cloth, at 14*s.* per yd.

yds.
967
7
£676 18*s.* *Ans.*

35. What must I pay for 796 yards of cloth, at 13*s.* per yard?

36. A fruiterer bought 148 boxes of oranges, and paid for each box 16*s.*; how much did he pay for all?

37. Bought 12 dozen pair of shoes, and paid for them 10*s* per pair; what did they cost?

38. A farmer bought 968 sheep, and gave for each 18*s.* how much did he give for all?

39. Bought 9 dozen hats, at 15 shillings each; what did the whole cost?

40. How much must I pay for the carriage of 748 tons of goods, at 18*s.* per ton?

41. Bought 763 cwt. of sugar, at 16*s.* per cwt.; how much did I pay for the whole?

42. Sold 12 dozen pairs of silk stockings, at 9*s.* per pair; what sum did I receive for the whole?

		s.
43.	6428 at	2
44.	9460 —	3
45.	7568 —	4
46.	3675 —	5
47.	4103 —	6
48.	2602 —	7
49.	3604 —	8
50.	8756 —	9
51.	3601 —	10
52.	5768 at	11
53.	2104 —	12
54.	6013 —	13
55.	7617 —	14
56.	2016 —	15
57.	3687 —	16
58.	1209 —	1
59.	4123 —	18
60	7641 —	19

CASE V.—*When the price is shillings and pence.*

RULE.—If the price be the aliquot part of a pound, divi by the aliquot part. If it be not an aliquot part, multipl by the shillings, and take aliquot parts of a shilling for the pence and farthings.

What is the price of 964 lbs. of tea, at 6*s.* 8*d.* per lb.?

```
6s. 8d.=⅓)964
        £321  6s. 8d.
```

What is the price of 268 yds. of cloth, at 7*s.* 6¼*d.* per yd.?

```
 6d.=½)268
         7
      ————
      1876 •
¼=1/12) 184
        11  2
     ————————
  2,0)202,1  2
     ————————
    £101 1s. 2d.
```

61. Paid 2*s.* [illegible]*d.* per yard for 768 yards of ribbon how much did I pay?

62. Received a chest of tea containing 278 lbs., for which paid 6*s.* 8½*d.* per lb.; what did the whole cost me?

63. A hosier bought 8 dozen pairs of silk stockings, for which he paid 6*s.* 9¾*d.* per pair; what did he pay in all?

64. A bootmaker sold, during the year, 279 pairs of boots, 18*s.* 10½*d.* per pair on an average; how much money did he get for the boots during the year?

65. Two tailors sold, during the year, 168 suits of boys' clothes, for which they were paid at the rate of 17*s.* 9½*d.* per suit; how much did they get during the year?

			s.	*d.*				*s.*	*d.*
66.	3468	at	3	6	75.	1201	at	12	10
67.	4976	—	4	7	76.	2768	—	13	7½
68.	5048	—	6	3½	77.	6475	—	14	9¾
69.	3162	—	5	8¾	78.	4687	—	15	7
70.	7643	—	8	7	79.	9621	—	16	9¼
71.	5736	—	9	4¾	80.	4103	—	17	8¾
72.	3987	—	9	8¼	81.	2464	—	18	4¼
73.	6426	—	0	6¼	82.	3102	—	18	5½
74.	8650	—	1	9½	83	6765	—	19	7¼

SE V - *When the price is pounds, shillings, pence, and farthings.*

RULE.—Multiply by the pounds, and take aliquot parts r the rest.

What is the value of 248 ests of tea, at 9*l.* 17*s.* 8*d.* er chest?

s. =½) 248
9
2232
. = ½) 124
. 6*d.*= ½) 62
2*d.*=1/15) 31
2 1 4
£2451 1*s.* 4*d.* *Ans.*

or thus:

10*s.* = ½)248
9
2232
6*s.* 8*d.*= ⅓)124
1*s.* =1/10) 82 13 4
12 8 0
£2451 1*s.* 4*d.* *Ans.*

84. How much do 268 cwt. of sugar come to, at 2*l.* 6*s.* 8*d.* er cwt.?

85. What rent do 796 acres yield at 3*l.* 14*s.* 6½*d.* per re?

86. What did 279 score of sheep cost, at 6*l.* 18*s.* 9*d.* per ore?

87. How much did a grocer pay for 948 cwt. of sugar, at . 17*s.* 6¾*d.* per cwt.?

88. A watchmaker sold 796 watches for 9*l.* 12*s.* 6*d.* each w much did he sell all for?

		£	*s.*	*d.*			£	*s.*	*d.*
89.	7964 at	7	9	6	97.	7204 at	12	16	7
90.	4679 —	8	17	8	98.	4121 —	13	14	8
91	8742 —	4	16	5½	99.	3145 —	14	17	9¼
92	2598 —	9	12	8¼	100.	6876 —	15	19	7
93	8764 —	10	17	6¾	101.	9684 —	16	18	6¾
94.	2687 —	12	14	7	102.	7780 —	17	13	4
95.	9648 —	8	11	4½	103.	4627 —	18	14	5
96.	2784 —	11	10	2	104.	8794 —	28	9	6½

CASE VI.—*When both the quantity and price are of seve*
denominations.

RULE.—Multiply the *price* by the highest name in t
quantity, and take parts for the rest of the quantity.

What is the price of 3 cwt. 2 qrs. 7 lbs. of sugar, at 3l. 6s. 8d. per cwt.?

qrs.	£	*s.*	*d.*
2=½)	3	6	8
			3
lbs.	10	0	0
7=⅓)	1	13	4
	0	4	2
	£11	17*s.*	6*d.*

What is the value of
cwt. 2 qrs. 14 lbs. at 3l. 1
6d. per cwt.?

qrs.	£	*s.*	*d.*	
2=½)	3	17	6	
			5	5×5=25
	19	7	6	
			5	
lbs.	96	17	6	
14=¼)	1	18	9	
	0	9	8¼	
	£99	5	11¼	

105. Sold 5 cwt. 1 qr. 8 lbs. of sugar, at 3l. 15s. 8d. p
cwt.; what did I get for the whole?

106. Bought 72 cwt. 2 qrs. 14 lbs. tobacco, at 4l. 16s.
per cwt.; what did the whole cost?

107. Bought 96 cwt. 3 qrs. 8 lbs. soap, at 3l. 12s. 8d. p
cwt.; how much did I pay for the whole?

108. Sold 27 cwt. 3 qrs. 14 lbs. cheese, at 1l. 10s. 6d. p
cwt.; what does the whole come to?

109. Bought 29 cwt. 2 qrs. 14 lbs., at 4l. 16s. 8d. per cw
what did I pay?

	cwt.	*qrs.*	*lbs.*		£	*s.*	*d.*
110.	24	2	7	at	2	16	7
111.	14	1	8	—	3	14	6
112.	7	3	6	—	4	15	8
113.	16	2	13	—	5	14	9
114.	17	1	16	—	6	13	2
115.	12	2	14	—	7	19	8

	cwt.	*qrs.*	*lbs.*		£	*s.*
116.	35	1	8	at	6	10
117.	36	2	7	—	4	12
118.	40	3	9	—	9	16
119.	42	2	16	—	8	14
120.	45	1	14	—	9	15
121	48	2	4	—	4	17

CASE VII.—*When the quantity contains a fraction.*

RULE.—Work for the whole number by the preceding rules nd to the result add the $\frac{1}{2}$ or $\frac{2}{5}$ or $\frac{3}{7}$ of the price, or whatever se the fraction in the quantity may be. The sum to be lded may be obtained by multiplying the price by the up-er figure of the fraction and dividing by the under figure.

What is the value of $246\frac{2}{5}$ cwt. of sugar, at 3*l.* 10*s.* 6*d.* er cwt.?

10*s.* = $\frac{1}{2}$)	246		
	3		
	738		
6*d.* = $\frac{1}{20}$)	123		
	6	3	
$\frac{2}{5}$ =	1	8	$2\frac{1}{4}-\frac{3}{5}$
	£868	11	$2\frac{1}{4}-\frac{3}{5}$

The value of the fraction is found thus:

	£	*s.*	*d*
	3	10	6
			2
5)	7	1	0
	£1	8	$2\frac{1}{4}-\frac{3}{5}$

2.	$4787\frac{1}{2}$ at	£3	10	6	128.	$7426\frac{2}{6}$ at	£6	15	8
3.	$7641\frac{1}{3}$ —	4	9	7	129.	$3278\frac{3}{5}$ —	2	12	6
4.	$8469\frac{2}{3}$ —	0	8	6	130.	$4625\frac{2}{7}$ —	0	14	$7\frac{1}{2}$
5.	$4210\frac{3}{4}$ —	0	5	$7\frac{3}{4}$	131.	$2010\frac{3}{5}$ —	6	16	9
6.	$8659\frac{7}{8}$ —	0	7	$11\frac{1}{4}$	132.	$3607\frac{1}{8}$ —	8	19	$8\frac{1}{2}$
7.	$4286\frac{4}{5}$ —	9	12	$6\frac{1}{2}$	133.	$1243\frac{2}{9}$ —	3	17	7

TARE AND TRET.

GROSS WEIGHT means the weight both of goods nd package, whether these packages be barrels, oxes, or sacks.

TARE is an allowance made to purchasers for the eight of the package.

TRET is an allowance of 4 lbs. on every 104 lbs. goods, for waste, or $\frac{1}{26}$ part of the whole.

CLOFF is an allowance of 2 lbs. on every 3 cwt. de to those who retail goods for turning the scales.

SUTTLE is what remains after part of the allow-nce is taken from the gross.

CASE I.—*When an allowance is made for the tare per barre box, or sack.*

What is the net weight of 4 hogsheads of sugar, eac weighing 13 cwt. 3 qrs. 14 lbs., the tare being 1 qr. 10 lb per hhd.?

cwt.	qrs.	lbs.		qr.	lb
13	3	14		1	1
		4			
55	2	0	1	1	1
1	1	12			
54	0	16			

RULE WITH EXAMPLE.—Multiply the weight of each hhd. by 4, to find the gross weight of the whole, 55 cwt. 2 qrs.; then multiply the tare upon each hhd., 1 qr. 10 lbs., by the number of hhds., 4, and you find the tare upon the 4 hhds. to be 1 cwt. 1 qr. 12 lbs.; place this under the gross of the 4 hhds., 55 cwt 2 qrs., and subtract. The remainder, 54 cwt. 0 qr. 16 lbs. is the net weight.

1. What is the net weight of 9 chests of tea, each weighing 5 cwt. 2 qrs. 19 lbs., tare 18 lbs. per chest?

2. What is the net weight of 6 chests of tea, each weighing 1 cwt. 3 qrs. 9 lbs., tare 18 lbs. per chest?

CASE II.—*When the tare is so much per cwt.*

Gross weight 173 cwt. 3 qrs. 17 lbs., tare 16 lbs. per cwt what is the net weight?

lb.	cwt.	qrs.	lb
14=⅛)	173	3	1
2=⅐)	21	2	2
	3	0	1
	24	3	
	149	0	

RULE WITH EXAMPLE.—Divide the gross weight, 173 cwt. 3 qrs. 17 lbs., by the aliquot part of a cwt.; thus, 14 lbs. is the ⅛ of a cwt.: divide by ⅛: again, 2 lbs. is the ⅐ of 14 lbs.; divide by ⅐; add the two quotients together, and 24 cwt. 3 qrs. 9 lbs. are obtained: let this be taken from the gross weight, 173 cwt. 3 qrs. 17 lbs., and 149 cwt. 0 qr. 8 lbs. are ob tained, which is the net weight. The remainders have no been attended to in this question, as they are not necessar in order to understand it.

3. What is the net weight of 7 hhds. of sugar, each 6 cw 3 qrs. 14 lbs. gross; tare 12 lbs. per cwt.?

4. What is the net weight of 8 hhds. of tobacco, each 8 cwt. 2 qrs. gross, tare 18 lbs. per cwt.?

5. The gross weight of 50 casks of butter is 202 cwt. 2 qrs. 12 lbs., tare 15 lbs. per cwt.; what is the net weight?

Case III.—*When allowance is to be made both for tare and tret.*

What is the net weight of 4 cwt. 2 qrs. 14 lbs. gross, tar 14 lbs. per cwt., tret as allowed?

Rule with Example.—Find the are by the foregoing rule, and subract it from the gross; divide the emainder, or suttle it, as it is called, by 26 (26 being the fourth of 104) for he tret; this, when subtracted from he suttle, leaves the net weight required.

cwt.	*qrs.*	*lbs.*	
4	2	14	gross
	2	8	tare
26)4	0	6	suttle
		17	tret
3	3	17	net

6. What is the net weight of 9 hhds. of tobacco, each weighing 5 cwt. 2 qrs. 12 lbs., tare 96 lbs. per hhd., tret a usual?

7. What is the net weight of 6 chests of tea, each weighing cwt. 3 qrs. 9 lbs., tare 18 lbs. per chest, tret as allowed?

8. The gross weight of 24 barrels of rice is 67 cwt. 2 qrs. 8 lbs., tare 1 qr. 12 lbs. per barrel, tret as usual; what is he net weight?

Case IV.—*When the tare, tret, and cloff are allowed.*

What is the net weight of 4 cwt. 2 qrs. 14 lbs. gross, tare 4 lbs. per cwt., tret as allowed, cloff as allowed?

Rule with Example.—Take the are and the tret from the gross as before; divide the remainder or suttle by 168 (168 being the half of 3 cwt. or 336 lbs.); this being subtracted, leaves the net weight. The cloff may also be obtained by multiplying the cwt. by the tret, suttle by 2, and divide by 3, receiving the quotient pounds thus, 2×3=6÷3=2 lbs.

cwt.	*qrs.*	*lbs.*	
14=⅛)4	2	14	gross
	2	8	tare
26)4	0	6	
		17	tret
168)3	3	17	suttle
		2	cloff
3	3	15	net

9. What is the net weight of 8 hhds. of sugar, each weighing 6 cwt. 3 qrs. 14 lbs., tare 12 lbs. per cwt., tret and cloff as usual ?

10. What is the net weight of 8 hhds. of tobacco, each 3 cwt. 2 qrs. gross, tare 18 lbs. per cwt., tret and cloff as allowed ?

11. The gross weight of 50 casks of butter is 202 cwt. 2 qrs. 12 lbs., tare 15 lbs. per cwt., tret and cloff as allowed; what is the net weight ?

12. What is the net weight of 24 hhds. weighing, gross, 47 cwt. 2 qrs. 18 lbs., tare 2 qrs. 18 lbs. per hhd., tret as usual ?

13. What is the net weight of 19 chests, each weighing 2 cwt. 13 lbs., tare 14 lbs. per chest, tret as allowed ?

14. What is the value of the net weight of 3 hhds. of tobacco, each weighing 4 cwt. 2 qrs. 12 lbs. gross, at 7*l.* 10*s.* 6*d.* per cwt., allowing 7 lbs. per cwt. for tare, tret as usual, and cloff 2 lbs. per hhd. ?

SIMPLE INTEREST.

Interest is money paid for the loan of money.

The principal is the sum of money lent.

The rate per cent. is the sum to be given for the loan of £100.

The amount is the principal and interest added together. Thus, if I get from a banker £100 at 5 per cent., I must pay him back at the end of the year the principal, viz. £100, and the interest, viz. £5. The principal and interest, viz. £105 that I pay, is the amount.

CASE I.—*To find the interest of any sum for one or more years.*

What is the interest of 26*l.* 10*s.* at 5 per cent. per annum for 3 years ?

Rule with Example. — Multiply the principal, 26*l.* 10*s.*, by the rate, 5, and divide the product, 132*l.* 10*s.*, by 100. The quotient, 1*l.* 6*s.* 6*d.*, is the interest of the principal for one year; this multiplied by the number of years, 3, will give the interest for the number of years, which in this instance is 3*l.* 19*s.* 6*d.*

```
      £  s.
     26 10
         5  £  s.  d.
100)132 10(1  6   6
    100           3
    ---    ---------
     32    3 19   6
     20
    ---
    650
    600
    ---
     50
     12
    ---
    600
    600
    ---
```

1. What is the interest of 267*l.* for 4 years, at 5 per cent.?

2. What is the interest of 964*l.* 15*s.* for 6 years, at 4 per cent.?

3. What is the interest of 2368*l.* 10*s.* for 4½ years, at 4½ per cent.?

4. What is the interest of 768*l.* 9*s.* 6*d.* for 9½ years, at 3¼ per cent.?

5. What is the amount of 9687*l.* for 7 years, at 5 per cent.?

6. What is the amount of 379*l.* 16*s.* for 9½ years, at 4¾ per cent.?

7. What is the interest of 4268*l.* 17*s.* 9*d.* for 20½ years, at ¼ per cent.?

8. What is the amount of 3786*l.* 14*s.* for 17 years, at 4⅜ per cent.?

9. What is the interest of 796*l.* 18*s.* 7*d.* for 19¾ years, at 3⅜ per cent.?

10. What is the amount of 968*l.* 16*s.* 7*d.* for 10¼ years, at 4⅝ per cent.?

CASE II.—*To find the interest for weeks and days.*

What is the interest of 400*l.* for 10 weeks and 3 days, at 4 per cent. per annum?

RULE WITH EXAMPLE.—Find, by Case I., the interest of 400*l.* for one year, at 4 per cent.; it is 16*l.* Multiply the number of days in the weeks and days, 73=10 weeks and 3 days, by the rate per cent. for one year, 16*l.*, and divide by the number of days in a year, 365; the quotient, 3*l.* 4*s.*, is the percentage for 73 days.

days. *days.* £
365 : 73 : : 16
16
438
73
365)1168(3*l.* 4*s.*
1095
73
20
)1460(4*s.*
1460

Or,

If, as is the case in this example, the number of days form an aliquot part of a year; divide the interest of one year by that aliquot part, 5, because 73 days is ⅕ of a year.

£
73=⅕)16
£3 4*s.*

11. What is the interest of 426*l.* for 6 weeks and 4 day at 5 per cent. per annum?

12. What is the interest of 764*l.* 16*s.* for 9 weeks and 3 days, at 4 per cent. per annum?

13. What is the interest of 376*l.* 14*s.* 8*d.* for 240 days, at 4½ per cent. per annum?

14. What is the amount of 748*l.* 17*s.* for 120 days, at 3¾ per cent. per annum?

15. What is the interest of 859*l.* 13*s.* for 6 years, 8 weeks and 4 days, at 2½ per cent. per annum?

16. What is the amount of 978*l.* for 3 years and 136 days at 4½ per cent. per annum?

17. What is the interest of 7462*l.* 13*s.* for 9 years and 6 weeks, at 3½ per cent. per annum?

18. What is the amount of 846*l.* for 12 years and 95 days at 4¾ per cent. per annum?

19. What is the interest of 764*l.* 7*s.* 6*d.* for 5 weeks and 3 days, at 3¼ per cent. per annum?

20. What is the amount of 9864*l.* 17*s.* 9*d.* for 10 years, 7 weeks, and 4 days, at 4⅜ per cent. per annum?

21. Required the interest of 460*l.* 12*s.* 6*d.* for 2 years and 4 months, at 5 per cent. per annum.

22. Required the interest of 326*l.* 15*s.* for 8 weeks and 5 days, at 4 per cent. per annum.

23. What is the amount of 864*l* for 120 days, at 4½ per cent. per annum?

24. What is the amount of 978*l.* for 6 years and 89 days, at 3¾ per cent. per annum?

25. What is the interest of 723*l.* 15*s.* 6*d.* for 3½ years, at 4¾ per cent. per annum?

26. Required the amount of 246*l.* 15*s.* for 3 years, 6 weeks, and 4 days, at 2½ per cent. per annum?

DISCOUNT.

Discount is an allowance made for the payment of money before it is due. Thus, if a person passed me a bill for £105, to be paid at the end of a year, and I wished money immediately, I might take it to a banker, who, if he was sure of getting the money at the end of the year, would give me £100, keeping £5 to himself for the interest of the £100 he had advanced. The £5 that the banker kept is called discount; and the £100 is the *present value* of £105 a year hence, at 5 per cent.

Rule.—As £100 with the interest for the given rate and time added to it is to the sum or debt, so is the interest of £100 for the given rate and time to the discount.

What is the discount on 250*l.*, due 6 months hence, at per cent.?

Example.—Here 2*l.* 10*s.* is added to 100*l.* for the first term, because 2*l.* 10*s.* is the interest of 100*l.* for 6 months at 5 per cent. The second term is the debt, viz. 250*l.* The third term is the interest on 100*l.* for 6 months, at 5 per cent. The answer is 6*l.* 1*s.* 11¼*d.*; subtract this from 250*l.*, and the present value of 260*l.* is obtained, viz. 243*l.* 18*s.* 0¾*d.*

```
 £   s.
100
  2  10     £      £  s.
102  10 : 250 :: 2 : 10
 20          50   20
2050    )12500    50
         6l. 1s. 11¼d
```

1. What is the present value of 640*l.*, due 2 years hence, at 5 per cent.?

2. What is the discount on 736*l.*, due 9 months hence, at 5 per cent.?

3. What is the discount on 370*l.*, due 100 days hence, at 4½ per cent.?

4. What is the discount on 246*l.* 16*s.* from March 26 to June 23, both days included, at 3¾ per cent.?

COMMISSION, BROKERAGE, INSURANCE, BUYING AND SELLING STOCKS.

Commission is an allowance given to an agent or factor, for buying or selling goods, negotiating bills, &c.

Brokerage is an allowance to a broker for procuring sales, transfers of property, &c.

Insurance is an allowance, called premium, given to persons who engage to make good the loss of ships, merchandise, houses, &c., that may be lost or damaged by storms, fire, &c.

Stock is the debt owing by government, or it is the capital of any trading company.

Any questions in these rules may be performed by the rules for Simple Interest.

EXAMPLES.

What is the commission on 426*l*. 16*s*. at 2½ per cent.?

```
          £    s.
        426   16
               2½
        853   12
     ½=213     8
 100)1067      0
        £10   13s. 4¾d.
```

What is the insurance on 426*l*. 16*s*. at 12½ per cent.?

```
          £    s.
        426   16
              12½
       5121   12
     ½= 213    8
 100)5335      0
        £53    7s.
```

or thus:

```
              £     s.   d.
  10=1/10)426     16    0
          42     13    7
  2=1/5 )  8     10    8½
  ½=¼   )  2      2    8
        £53      6s. 11½d.
```

What is the brokerage on 426*l*. 16*s*. at 5*s*. or ¼ per ct.?

```
           £     s.
      ¼)426    16
  100)106      14
       £1      1s. 4¼d.
```

What is the purchase of 426*l*. bank stock, at 110¼ per cent.?

```
           £
          426
          110¼
        46860
    ¼=    106    10
  100)46966      10
        £469    13s. 3½d
```

or thus:

```
                 £    s.   d.
  10=1/10)426
  ¼=1/40)  42   12
            1    1   3½
         £469  13s.  3½d.
```

EXERCISES.

1. What is the commission on 496*l*. 16*s*. 6*d*., at 2½ per cent.?

2 What is the commission on 1248*l.* 19*s.*, at ½ per cent.

3 What is the brokerage on 3964*l.* 14*s.*, at 1½ per cent.

4 What is the brokerage on 467*l.*, at ¾ per cent. ?

5. I employed an agent to sell a quantity of goods: having agreed to give him ¾ per cent. upon the sales, the goo
having sold for 7648*l.*, how much am I to pay him ?

6. An agent charges 4½ per cent. for commission and ri
of bad debts: his sales in the year are 16,780*l.* and his lo
347*l.*; what is his income ?

7. A salesman disposes of woollen goods to the amount
1467*l.*, muslins to 1842*l.*, and hardware to 964*l.*; what is hi
commission at 2⅓ per cent. ?

8. What premium must be paid for insuring a house f
7684*l.*, at 2¼ per cent. ?

9.* What is the premium on 4968*l.*, at 5¼ guineas pe
cent. ?

10. What is the insurance on 6968*l.* for 2 years, at 4
per cent. ?

11. What is the premium on 7848*l.*, at 6 guineas pe
cent. ?

12. What is the insurance on 796*l.* for 3 years and 4
days, at 3¼ per cent. ?

13. What is the value of 796*l.* stock, at 105 per cent. ?

14. What is the purchase of 978*l.* India stock, at 74
per cent. ?

15. What is the price of 7468*l.* bank stock, at 168 pe
cent. ?

16. What is the brokerage on 429*l.* 16*s.* 6*d.*, at 2½ pe
cent. ?

---

* If the rate be in *guineas*, calculate as if it were *pounds*, and a
one-twentieth to the amount.

17. Required the commission on 648*l.*, at 2¼ per cent.

18. What is the premium of insurance on 968*l.*, at 4*l.* 12*s.* 3*d.* per cent.?

19. What is the expense of insuring a ship and cargo, at 8*l.* 15*s.* per cent.; the ship being worth 2450*l.* and the cargo worth 4768*l.*?

20. At 4½ per cent., how much must be insured on goods worth 768*l.*, so that in case of loss the owner may receive the value of the goods and the premium?

21. I allow my broker 3¾ per cent.; how much do I owe him for selling goods to the amount of 796*l.*?

22. What is the purchase of 3450*l.* India stock, at 112¼ per cent.?

23. What is the purchase of 268*l.* 16*s.* 6*d.* bank stock, at 76½ per cent.?

COMPOUND INTEREST.

Compound Interest is interest, not only for the use of the sum borrowed, but also for the use of the interest, if it be not paid at the end of a year. Thus, if I borrow £100 at 5 per cent., I owe at the end of the year £105. If I wish to pay off the debt, I pay £105. If I wish merely to pay the interest, I pay £5, and still owe £100. If, however, I do neither, it is obvious that at the end of the second year, I must pay interest, not upon £100, but upon £105

What is the compound interest of 240*l.* 10*s.* for 3 years, 5 per cent.?

	£	s.	d.	
$5=\frac{1}{20}$)	240	10	0	1st year's principa
add	12	0	6	1st year's interest
$\frac{1}{20}$)	252	10	6	2d year's principa
add	12	12	6¼	2d year's interest.
$\frac{1}{20}$)	265	3	0¼	3d year's principa
add	13	5	1¾	3d year's interest
	278	8	2	amount in 3 years
subtract	240	10	0	principal.
	£37	18	2	compound intere for 3 years.

RULE WITH EXAMPLE.—Find the interest upon the principal for 1 year at 5 per cent., viz. 13*l.* 0*s.* 6*d.* and add it to the principal. At the beginning of the second year the principal is 252*l.* 10*s.* 6*d.*; find the interest upon this for 1 year, at 5 per cent., add it and so on for any number of years.—278*l.* 8*s.* 2*d.* is what 240*l.* 10*s.* *amount* to in 3 years. The compound interest is found by taking the original principa 240*l.* 10*s.*, from the amount in 3 years, 278*l.* 8*s.* 2*d.*, and wha remains, 37*l.* 18*s.* 2*d.*, is the compound interest on 240*l.* 10 for 3 years.

1. Required the interest on 420*l.* for 3 years, at 5 per cen

2. Required the amount of 640*l.* for 4 years, at 3 per cen

3. What will 436*l.* amount to in 3 years, at 4½ per cent

4. What is the compound interest on 678*l.* 10*s.* for years, at 3½ per cent. per annum?

5. What will 764*l.* amount to in 4 years, at 6 per cent.?

6. What is the compound interest on 786*l.* 10*s.* for years, at 4½ per cent. per annum?

BARTER.

When one person gives goods to another, and receives not money, but goods in return, he is said to barter.

How many yards of cloth, at 10*s.* per yard, ought I to get or 98 lbs. of tea, at 8*s.* per pound?

Rule with Example.—Find the value of he goods given. In this example the value f the tea is found to be 784*s.*; you have, herefore, to consider how many yards of loth you ought to receive for 784*s.*, the value f 1 yard being 10*s.*

lbs.
98
8
10)784
$78\frac{4}{10}$

All the questions in this rule may be found either by Simple Proportion or Practice

1. How many pairs of shoes, at 12*s.* per pair, must be given for 206 pairs of stockings, at 2*s.* per pair?

2. How much tea, at 7*s.* per lb., ought I to receive for 1 wt. of coffee, at 2*s.* per lb.?

3. How much brandy, at 23*s.* per gallon, ought I to re eive for 98 gallons of rum, at 15*s.* per gallon?

4. A chandler gave 2 cwt. 3 qrs. of tallow, at 1*l.* 18*s.* 6*d* per cwt.; how much soap ought he to receive at 5*d.* per lb.?

5. How much iron at $1\frac{1}{2}$*d.* per lb. ought a nailer to receive or 9860 nails, at $6\frac{1}{2}$*d.* per hundred?

PROFIT AND LOSS.

The use of this rule is to discover how much is gained or lost in buying and selling goods.

Case I.—*When the prime cost and selling price are given, to find the entire gain or loss on any quantity of goods.*

Bought 12 yards of cloth, at 9*s.* 8*d.* per yard, and sold it t 11*s.* 6*d.*; what did I gain on the whole?

Rule with Example.—Subtract the cost price, 9*s.* 8*d.*, from the selling price, 11*s.* 6*d.*, d multiply the gain upon one yard, 1*s.* 0*d.*, by the number of yards bought, 12. The product, 1*l.* 2*s.*, is the gain on the 12 ards.

	s.	*d.*
	11	6
	9	8
	1	10
		12
£1	2	-

1. Bought 256 yards of cloth, at 12*s.* 9*d.* per yard, and s
it at 14*s.* 9*d.*; what did I gain?

2. Bought 406 lbs. of butter, at 10*d.* per lb., and sold i
14*d.* per lb.; what was gained on the whole?

3. Bought 248 pairs of stockings, at 1*s.* 8*d.* per pair,
sold the whole for 12*l.* 16*s.*; what was the gain or loss?

4. Bought 9 cwt. of cheese, at 2*l.* 12*s.* per cwt., and sol
at 2*l.* 18*s.* per cwt.; what was the gain upon the whole?

5. Sold a chest of tea containing 144 lbs. for 57*l.* 10*s.*; h
much did I gain, the tea having cost me 6*s.* 8*d.* per lb.?

CASE II.—*The first cost and selling price being given, to*
the gain per cent.

Bought cloth at 12*s.* per yard and sold it at 14*s.* per y
what was the gain per cent.?

RULE WITH EXAMPLE.—Find the gain or loss by the former case; then say, as the cost price, 12*s.*, is to the gain, 2*s.*, so is 100*l.* to the gain or loss per cent.

```
      s.
      14
      12
s.    —       l.
12 : 2 : :  100
             20
           ————
           2000
              2
         ——————
       12)4000
      2,0)33,3
        ——————
        £16 13
```

6. If a pound of tea be bought for 6*s.* 6*d.*, and sold for
4*d.*, what is the gain per cent.?

7. When wine is bought for 18*s.* 6*d.* per gallon, and s
for 27*s.* 8*d.* per gallon, what is the gain per cent.?

8. Bought a quantity of goods for 64*l.*, and sold them
76*l.*; what was the gain per cent.?

9. Bought cloth at 6*s.* 8*d.* per yard; but finding it not
good as I expected, I was obliged to sell it at 6*s.* 4*d.*; h
much did I lose per cent.?

PARTNERSHIP.

Partnership is when two or more persons unite in trade, and agree to share the profits or losses, according to the terms of agreement.

CASE I.—*Partnership without time.*

RULE.—As the whole capital is to the whole gain or loss, so is each partner's stock to his share of the gain or loss.

EXAMPLE.—A., B., and C. entered into partnership: A. gave 400*l.*, B. 500*l.*, and C. 700*l.*; they gained 350*l.*; what is each partner's share of the gain?

Capitals.
A. 400
B. 500
C. 700
£1600

1600*l.* : 350*l.* : : 400*l.* : 87*l.* 10*s.* 0*d.* A.'s gain
400
16,00)1400,00
£87 10

1600*l.* : 350*l.* : : 500*l.* : 109*l.* 7*s.* 6*d.* B.'s gain
500
16,00)1750,00
£109 7 6

1600*l.* : 350*l.* : : 700*l.* : 153*l.* 2*s.* 6*d.* C.'s gain
700
16,00)2450,00
£153 2 6

1. Two persons, A. and B., entered into partnership; A. put into the business 865*l.*, B. 2608*l.*; they gain 964*l.*: what was each person's share of the profit?

2. Three merchants freight a ship to America; the value of the cargo was 2640*l.*: of this 686*l.* belonged to A.; 1200*l.* to B.; and the rest to C.: they lose upon the whole cargo 524*l.*; what is each merchant's share of the loss?

3. Three wine merchants freighted a ship with 468 pipes of wine, of which 142 pipes belonged to A., 204 to B., and the rest to C. During a storm the sailors were obliged to throw overboard 96 pipes; what was the loss sustained by each?

4. Three persons pay a tax of 100*l.* in proportion to the annual value of their property. A.'s property is worth 800*l.* per annum, B.'s 600*l.*, and C.'s 400*l.*; how much is each to pay?

CASE II.—*Partnership with time.*

RULE.—Multiply each person's money by the time it is continued in the business, and proceed as in Case I.

EXAMPLE.—Three persons enter into partnership: A. puts in 200*l.* for 4 months; B. 400*l.* for 6 months; and C. 800*l.* for 7 months. They gain 500*l.*; what is each person's share of the gain?

```
Capital.
A. 200×4= 800  8800l. : 500l. : : 800l. : 45l. 9s. 1d. A.'s gain
B. 400×6=2400                 800
C. 800×7=5600   88,00)4000,00
         8800         £45 9 1
       8800l. : 500l. :: 2400l. : 136l. 7s. 3¼d. B.'s gain
                        2400
        88,00)12000,00
              £136   7   3¼
       8800 : : 500l. :: 5600l. : 318l. 3s. 7½d. C.'s gain
                        5600
        88,00)28000,00
              £318   3   7½
```

5. A., B., and C. enter into business: A. puts in 968*l.*, B. 1420*l.*, and C. 2470*l.* A.'s money was in the business years, B.'s 5 years, and C.'s years: they gained 2348*l.* how ought the gain to be divided among them?

6. Three graziers rented a piece of land for 98*l.*: A. put 6 cows on the land for 4 months, B. 5 cows for 7 months and C. 9 cows for 6 months; how much ought each to pay of the rent?

7. A., B., C., and D. put each into partnership 750*l.*: A.'s money remains 7 months, B.'s 9 months, C.'s 11 months, and D.'s a year: they gain 438*l.*; what is each person's share of the gain?

VULGAR FRACTIONS.

A Fraction is a part of any thing, and is represented by two numbers: one above the line and the other below it; thus, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$: read, one-half, two-thirds, three-fourths.

The figure above the line is called the *numerator*, the figure below the line is called the *denominator*; thus, in the fraction $\frac{4}{5}$, read four-fifths, the 4 is the numerator and the 5 is the denominator

The denominator marks the number of equal parts into which the whole is divided; the numerator shows the number of those intended to be expressed by the fraction: thus, if I say that I have $\frac{2}{3}$ of an apple, I mean that the apple was divided into three equal parts, and that I have two of these parts.

A Proper Fraction is that which has its numerator *less* than its denominator; as $\frac{1}{2}$, $\frac{2}{3}$, $\frac{4}{7}$.

An Improper Fraction is that which has its numerator *greater* than its denominator; as $\frac{3}{2}$, $\frac{7}{4}$, $\frac{8}{5}$.

A Compound Fraction is a fraction of a fraction and is expressed by two or more fractions, as $\frac{2}{3}$ of $\frac{3}{4}$, or $\frac{1}{3}$ of $\frac{2}{5}$ of $\frac{4}{9}$.

A Mixed Number is a whole number with a fraction annexed; as $2\frac{1}{2}$, $4\frac{2}{3}$, $16\frac{4}{5}$.

Any whole number may be made a fraction of by writing a 1 under it for a denominator; for example, 6 may be made a fraction of by writing it thus, $\frac{6}{1}$, or 10 thus, $\frac{10}{1}$. The value of a fraction is not altered by multiplying or dividing both the numerator and denominator, provided both be multiplied or divided by the same number.

REDUCTION.

CASE I.—*To change an improper fraction into a whole or mixed number.*

RULE.—Divide the numerator by the denominator, and if there be any remainder write the denominator under it in the form of a fraction.

EXAMPLE.—Reduce the improper fraction, $\frac{1367}{5}$, to a whole or mixed number.

$$5)\underline{1367}$$
$$273\tfrac{2}{5}\ \textit{Ans.}$$

1. Reduce $\frac{7463}{3}$ to its equivalent whole or mixed number.
2. Reduce $\frac{2463}{14}$ to its equivalent whole or mixed number
3. Reduce $\frac{2756}{43}$ to its equivalent whole or mixed number
4. Find the value of $\frac{81237}{608}$ in whole or mixed numbers.
5. Find the value of $\frac{8361}{89}$ in whole or mixed numbers.

Reduce the following fractions to whole or mixed numbers:

6. $\frac{8586}{43}$
7. $\frac{7982}{686}$
8. $\frac{3643}{2104}$
9. $\frac{742615}{7687}$
10. $\frac{948760}{2760}$
11. $\frac{493001}{487605}$
12. $\frac{736201}{7076}$
13. $\frac{480019}{3684}$
14. $\frac{876346}{4568}$

CASE II.—*To reduce a mixed number to an improper fraction.*

RULE.—Multiply the whole number by the denominator of the fraction; add the numerator, and under the product place the denominator.

EXAMPLE.—Reduce the mixed number $46\frac{3}{5}$ to an improper fraction.

$$46\tfrac{3}{5}$$
$$\underline{5}$$
$$230+3=\tfrac{233}{5}$$

Reduce the following mixed numbers to their equivalent improper fractions:

15. $7\frac{1}{2}$
16. $8\frac{2}{3}$
17. $17\frac{4}{5}$
18. $9\frac{7}{9}$
19. $27\frac{4}{5}$
20. $647\frac{2}{15}$
21. $360\frac{10}{17}$
22. $976\frac{21}{36}$
23. $842\frac{17}{36}$
24. $684\frac{19}{27}$
25. $976\frac{24}{128}$
26. $843\frac{31}{421}$
27. $687\frac{28}{117}$
28. $769\frac{111}{112}$
29. 807 [illegible]

CASE III.—*To reduce a compound fraction to a simple fraction.*

RULE.—Multiply together all the numerators for a numerator, and all the denominators for a denominator.

EXAMPLE.—Reduce the compound fraction $\frac{2}{3}$ of $\frac{6}{7}$ of 5 to a simple fraction. $\frac{2}{3}\times\frac{6}{7}\times\frac{5}{1}=\frac{60}{21}$ *Ans.*

Reduce the following compound fractions to their equivalent simple ones:

30. $\frac{3}{8}$ of $\frac{2}{7}$ of $\frac{5}{4}$
31. $\frac{7}{9}$ ... $\frac{3}{11}$ ... $\frac{8}{15}$
32. $\frac{5}{13}$ ... $\frac{17}{3}$ ... $\frac{11}{29}$
33. $\frac{4}{9}$ ... $\frac{8}{11}$ ... $\frac{11}{12}$
34. $\frac{7}{17}$ ... $\frac{8}{19}$ ... 7
35. $\frac{17}{23}$ of $\frac{8}{9}$ of $\frac{3}{25}$ of $\frac{13}{19}$
36. $\frac{11}{37}$ ... $\frac{1}{4}$ ... $\frac{18}{33}$ ... $19\frac{1}{8}$
37. $\frac{11}{21}$ ... $\frac{17}{36}$ ... $\frac{135}{78}$ ... 24
38. $\frac{3}{7}$ ... $\frac{9}{17}$ ... $\frac{29}{78}$ ... 32
39. $\frac{7}{15}$ ... $\frac{13}{19}$ ... $\frac{21}{39}$ ... $27\frac{2}{5}$

CASE IV.—*To reduce a fraction to its lowest terms.*

RULE.—Divide the numerator and denominator by any number that will measure them; that is, that will divide them without a remainder. Do the same with the quotients as long as any number can be found to divide them.

Reduce $\frac{144}{240}$ to its lowest terms.

Divide the fractions and the quotients by the figures placed above them.

$$\overset{(2)}{\frac{144}{240}}=\overset{(2)}{\frac{72}{120}}=\overset{(3)}{\frac{36}{60}}=\overset{(2)}{\frac{12}{20}}=\overset{(2)}{\frac{6}{10}}=\frac{3}{5}\ \textit{Ans.}$$

Or,

If a number be wished for that may bring the fraction to its lowest terms at once, divide the greater term by the less and the divisor by the remainder; and so on, dividing each divisor by the last remainder till nothing remains. The last *divisor* is the number by which, if the numerator and denominator of the fraction be divided, the lowest term will be obtained.

Reduce $\frac{144}{240}$ to its lowest terms.

The denominator of the fraction being greater, it is divided by the numerator. The former divisor, 144, is now to be divided by the remainder, 96; the remainder, 48, is now to divide the former divisor, 96. The last divisor 48, is the number by which, if the numerator and denominator be divided, the lowest term will be obtained; thus, 48)$\frac{144}{240}=\frac{3}{5}$, as i former example.

```
144)240(1
    144
     96)144(1
         96
         48)96(2
            96
```

Reduce the following numbers to the lowest terms:

40. $\frac{48}{272}$	44. $\frac{740}{8673}$	48. $\frac{55}{5005}$
41. $\frac{46}{115}$	45. $\frac{764}{3246}$	49. $\frac{1245}{225}$
42. $\frac{176}{484}$	46. $\frac{644}{1728}$	50. $\frac{1344}{1536}$
43. $\frac{48}{156}$	47. $\frac{825}{1920}$	51. $\frac{1408}{1664}$

CASE V.—*To reduce fractions to a common denominator.*

RULE.—Multiply each numerator by all the denomina ors, *except its own*, for a new numerator; and multiply al he denominators together for a new denominator.

Reduce $\frac{2}{3}$, $\frac{3}{5}$, and $\frac{4}{7}$ to a common denominator

Here the first numerator, 2, is multiplied by 5 and 7, the denominators of the other fractions. Mark that it is not multiplied by its own denominator, 3. The same is done to the other numerators. Th answer then is $\frac{70}{105}$, $\frac{63}{105}$, $\frac{60}{105}$.

$$\left.\begin{array}{l} 2\times5\times7=70 \\ 3\times3\times7=63 \\ 4\times3\times5=60 \end{array}\right\}\text{numerators}$$

$$3\times5\times7=105 \text{ com. denom}$$

Reduce the following fractions to others having a common denominator.

52. $\frac{3}{4}$, $\frac{2}{3}$, and $\frac{4}{5}$.	56. $\frac{17}{24}$, $\frac{19}{28}$, $\frac{15}{42}$, and $\frac{13}{17}$.
53. $\frac{5}{6}$, $\frac{7}{8}$, and $\frac{6}{9}$.	57. $\frac{21}{47}$, $\frac{18}{39}$, $\frac{41}{56}$, and $\frac{27}{78}$.
54. $\frac{9}{11}$, $\frac{7}{13}$, and $\frac{12}{19}$.	58. $\frac{71}{81}$, $\frac{39}{261}$, $\frac{410}{701}$, and $\frac{75}{813}$.
55. $\frac{13}{16}$, $\frac{11}{23}$, and $\frac{18}{24}$.	59. $\frac{813}{461}$, $\frac{710}{4698}$, $\frac{762}{985}$, and $\frac{8}{43}$

ADDITION.

RULE.—Reduce compound fractions to simple fractions, and mixed numbers to improper fractions. Having done this, bring them to a common denominator. Add all the numerators together, and place, under the result, the common denominator. If the answer be an improper fraction, bring it to a mixed number.

Add together the following fractions: $\frac{2}{3}$, $\frac{3}{5}$, and $4\frac{1}{2}$.

Here the mixed number $4\frac{1}{2}$ is first brought to the improper fraction $\frac{9}{2}$, and then all the fractions are brought to a common denominator.

$$\left.\begin{array}{r} 2\times5\times2=\ \ 20 \\ 3\times3\times2=\ \ 18 \\ 9\times3\times5=135 \end{array}\right\}\text{numerators}$$
$$\overline{3\times5\times2}=\overline{\ \ 30}\ \text{com. denom.}$$

Therefore $\frac{20}{30}+\frac{18}{30}+\frac{135}{30}=\frac{173}{30}=5\frac{23}{30}$ sum required.

Add together the following fractions and mixed numbers

1. $\frac{2}{3}+\frac{3}{5}+\frac{4}{9}$
2. $\frac{3}{7}+\frac{9}{11}+\frac{12}{13}$
3. $\frac{4}{7}+\frac{11}{16}+\frac{18}{23}$
4. $\frac{7}{9}+\frac{13}{17}+\frac{14}{19}+\frac{23}{121}$
5. $\frac{8}{13}+\frac{11}{25}+\frac{9}{17}+\frac{14}{39}$
6. $\frac{21}{42}+\frac{41}{53}+\frac{71}{89}+\frac{22}{23}$
7. $\frac{2}{5}$ of $\frac{6}{7}+\frac{2}{13}+\frac{2}{3}$ of $\frac{7}{8}$
8. $\frac{4}{7}+\frac{9}{11}$ of $\frac{12}{19}+\frac{4}{9}$ of $5\frac{1}{2}$
9. $\frac{13}{18}$ of $7\frac{2}{3}$ of $9+\frac{2}{7}$ of 14
10. $\frac{21}{23}+\frac{11}{15}$ of $2\frac{2}{3}+\frac{2}{9}$ of 6
11. $\frac{17}{19}$ of $\frac{23}{49}$ of $17\frac{4}{9}+\frac{4}{7}$ of 12
12. $\frac{13}{27}+\frac{19}{23}$ of $9\frac{2}{3}+\frac{11}{35}$ of $8\frac{4}{7}$

SUBTRACTION.

RULE.—Reduce the fractions to common denominators, as in addition. Find the difference of the numerators, under which write the common denominator.

From $\frac{12}{15}$ take $\frac{4}{7}$.

Here the fractions are first brought to a common denominator, then the 60 taken from 84, and the common denominator written under the difference.

$$\left.\begin{array}{r} 12\times\ 7=\ 84 \\ 4\times15=\ 60 \end{array}\right\}\text{numerators}$$
$$\overline{15\times\ 7}=\overline{105}\ \text{com. denom.}$$

Therefore $\frac{84}{105}-\frac{60}{105}=\frac{24}{105}$ the answer.

What is the difference between the following fraction

1. $\frac{4}{7}-\frac{3}{4}$
2. $\frac{6}{11}-\frac{8}{9}$
3. $\frac{7}{13}-\frac{4}{13}$
4. $\frac{9}{13}-\frac{8}{19}$
5. $4\frac{1}{2}-\frac{9}{16}$
6. $2\frac{7}{8}-5\frac{4}{7}$
7. $2\frac{1}{8}-3\frac{2}{5}$
8. $6\frac{4}{7}-9\frac{1}{16}$
9. $\frac{9}{11}-\frac{1}{13}$ of
10. $\frac{11}{54}-\frac{3}{28}$ of
11. $169-14$
12. $76\frac{1}{4}-\frac{2}{3}$ of 1

MULTIPLICATION.

RULE.—Reduce the mixed numbers to improper fractio and compound fractions to simple ones; after this has be done, multiply all the numerators together for the nume tor of the product, and all the denominators together for denominator.

Multiply $6\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{7}{8}$.

$6\frac{2}{3}=\frac{20}{3}$ and $\frac{2}{3}$ of $\frac{7}{8}=$
then $\frac{20}{3}\times\frac{14}{24}=\frac{280}{72}=3\frac{64}{72}$

Here the mixed number $6\frac{2}{3}$ is converted into the improper fraction $\frac{20}{3}$, and the compound fraction $\frac{2}{3}$ of $\frac{7}{8}$ into the simp fraction $\frac{14}{24}$. The numerators and denominators bei multiplied, produce the improper fraction $\frac{280}{72}$, whi being reduced to a mixed number gives $3\frac{64}{72}$ the answ

Multiply together the following fractions.

1. $\frac{3}{4}\times\frac{5}{8}$
2. $\frac{7}{9}\times\frac{8}{11}$
3. $\frac{9}{11}\times\frac{11}{12}$
4. $\frac{4}{13}\times\frac{4}{27}$
5. $8\frac{3}{4}\times\frac{5}{12}$
6. $7\times\frac{5}{13}$
7. $5\frac{3}{8}\times11\frac{1}{4}$
8. $3\frac{5}{8}\times4\frac{5}{6}$
9. $8\frac{2}{3}\times\frac{2}{3}$ of $\frac{7}{8}$
10. $16\times\frac{4}{7}$ of $\frac{8}{13}$
11. $17\frac{2}{5}\times\frac{17}{19}$ of $7\frac{4}{9}$
12. $24\frac{7}{13}\times\frac{13}{18}$ of 9

DIVISION.

ULE.—Prepare the fractions as in multiplication; then rt the divisor, and proceed as in multiplication.

Divide $\frac{4}{7}$ by $\frac{3}{5}$. $\frac{4}{7}\div\frac{3}{5}$ inverted thus $\frac{4}{7}\times\frac{5}{3}=\frac{20}{21}$

1. Divide $\frac{14}{5}$ by $\frac{11}{12}$
2 $\frac{21}{80}$ $\frac{3}{10}$
3. $\frac{15}{16}$ $\frac{4}{5}$
4. $\frac{33}{35}$ $\frac{3}{8}$
5. $\frac{12}{37}$ $\frac{18}{43}$
6. $\frac{16}{351}$ $\frac{4}{27}$
7. Divide $5\frac{5}{7}$ by $\frac{5}{7}$
8. $3\frac{31}{48}$ $\frac{5}{12}$
9. $3\frac{1}{6}$ $9\frac{1}{2}$
10. $9\frac{1}{6}$ $\frac{1}{2}$ of 7
11. $116\frac{4}{15}$ $\frac{1}{3}$ of $5\frac{1}{3}$
12. $\frac{2}{3}$ of $\frac{3}{4}$ by $\frac{1}{2}$ of $\frac{2}{3}$

REDUCTION, CONTINUED.

VI.– *To reduce fractions from one denomination to another.*

ULE.—If from a lower name to a higher, multiply the *ominator*, as in reduction of whole numbers. If from a her name to a lower, multiply the *numerator*, as in retion of whole numbers.

Reduce $\frac{2}{3}$ of a farthing to the fraction of a pound.

ere the denominator is multied, as it is to be brought to a her name.

$$\frac{2}{3\times4\times12\times20}=\frac{2}{2880}$$

Reduce $\frac{3}{5}$ of a pound to the fraction of a penny.

Here the numerator is multiplied, as s to be brought to a lower name.

$$\frac{3\times20\times12}{5}=\frac{720}{5}$$

1 Reduce $\frac{3}{7}$ of a farthing to the fraction of a pound
2 Reduce $\frac{4}{7}$ of a pound to the fraction of a penny.
3 Reduce $\frac{4}{5}$ of a shilling to the fraction of a guinea.
4 Reduce $\frac{4}{7}$ of a shilling to the fraction of a farthi
5 Reduce $\frac{7}{9}$ of a farthing to the fraction of a crown.
6 Reduce $\frac{3}{10}$ of a day to the fraction of a week.
7 Reduce $\frac{7}{9}$ of a week to the fraction of an hour.
8 Reduce $\frac{4}{5}$ of a nail to the fraction of a yard.
9 Reduce $\frac{7}{8}$ of a cwt. to the fraction of a dram.
10 Reduce $\frac{4}{5}$ of a yard to the fraction of a mile.

CASE VII.—*To express any given quantity as a fraction o another quantity, considered as an integer.*

RULE.—Reduce both quantities to one denomination; the make the reduced integer the denominator, and the othe quantity the numerator.

What part of 1*l.* is 13*s.* 4*d.*?

Here both quantities, the 1*l.* and the 13*s.* 4*d.*, are reduced to pence; the pence in the integer, 240, is made the denominator, and the pence in the other quantity is made the numerator: the fraction, $\frac{160}{240}$ of a pound, is, when brought to its lowest terms, equal to $\frac{2}{3}$ of a pound.

£	s.
1	
20	13
20	12
12	160
240	

then $\frac{160}{240}=\frac{2}{3}$ Ans

11. Reduce 14*s.* 6*d.* to the fraction of a pound.
12. Reduce 17*s.* 4*d.* to the fraction of a pound.
13. Reduce 5*s.* 8$\frac{1}{4}$*d.* to the fraction of a pound.
14. Reduce 17*s.* 9*d.* to the fraction of a penny.
15. Reduce 6*s.* 7$\frac{3}{4}$*d.* to the fraction of a farthing.
16. Reduce 7 hours 21 minutes to the fraction of a day.

17. Reduce 7 lbs. 3 drams to the fraction of a cwt.

18. Reduce 8 cwt. 2 qrs. 14 lbs. to the fraction of an
unce.

19. Reduce 3 lbs. 9 oz. to the fraction of a dwt.

20. Reduce 16 hours 13 minutes to the fraction of a day.

CASE VIII.—*To find the value of a fraction.*

RULE.—Reduce the numerator to the next inferior name, nd divide by the denominator; reduce the remainder, if ny, to the next lower name, and divide again, and so on to he lowest name.

What is the value of $\frac{7}{8}$ of a pound sterling?

Here the numerator, 7, is multiplied by 20, o bring it to the next inferior name, 140*s.* he 140*s.* are divided by 8, which gives 17*s.* nd 4 of a remainder; the 4 is multiplied by 2, to bring it to the next inferior name, 48*d.*; ; is then divided by 8, which gives 6 without ry remainder. The answer then is 17*s.* 6*d.*, hich is the $\frac{7}{8}$ of a pound.

```
   7
  20
8)140
  17  4
     12
   8)48
      6
```

21. What is the value of $\frac{6}{7}$ of a pound?

22. What is the value of $\frac{5}{6}$ of a shilling?

23. What is the value of $\frac{4}{5}$ of a crown?

24. What is the value of $\frac{9}{11}$ of a day?

25. What is the value of $\frac{13}{23}$ of a guinea?

26. What is the value of $\frac{4}{9}$ of a yard, long measure?

27. What is the value of $\frac{13}{16}$ of a lb. troy?

28. What is the value of $\frac{13}{16}$ of a pound avoirdupois?

29. What is the value of $\frac{23}{27}$ of a cwt.?

30. What is the value of $\frac{17}{24}$ of a mile?

PROMISCUOUS EXERCISES.

If the fractions be of different denominations, it will be necessary to bring them to the same name before they are added or subtracted.

1. To $\frac{3}{7}$ of a pound add $\frac{4}{5}$ of a shilling.
2. To $\frac{4}{7}$ of a crown add $\frac{3}{8}$ of a shilling and $\frac{2}{3}$ of a penny
3. From $\frac{6}{9}$ of a pound take $\frac{6}{9}$ of a shilling.
4. From $\frac{4}{11}$ of a shilling take $\frac{3}{5}$ of $\frac{2}{3}$ of a penny.
5. What is the value of $\frac{5}{8}$ yd. of cloth at $\frac{15}{18}$*l.* per yd.?
6. What is the value of $\frac{5}{7}$ oz. of silver at $3\frac{4}{7}$*l.* per lb.?
7. If $8\frac{5}{7}$ yards of cloth cost $49\frac{3}{5}$*s.*, what is the price per yard?
8. What is the price per yard, when 3 pieces of cloth, each $12\frac{3}{7}$ yards, cost $46\frac{5}{9}$*l.*?
9. What is the difference between $\frac{2}{3}$ of a league and $\frac{5}{8}$ of a mile?
10. What is the sum of $\frac{4}{5}$ of a cwt., $7\frac{4}{8}$ lbs., and $4\frac{8}{9}$ oz.?
11. From $\frac{7}{8}$ of a guinea take $\frac{3}{4}$ of a pound.
12. What is the sum of $\frac{2}{3}$ of a guinea, $\frac{3}{7}$*l.*, and $\frac{5}{8}$ of a crown?
13. How much is 8 times $\frac{15}{18}$ of a yard?
14. How much is $\frac{3}{16}$ of $\frac{2}{3}$ of a pound sterling?
15. A yard of ribbon cost 17*d.*; what is the price of $\frac{1}{4}$ of $\frac{1}{4}$ of a yard?
16. If $\frac{3}{7}$ of a yard cost $\frac{4}{15}$*l.*, what ought to be paid for $6\frac{2}{3}$ yards?
17. If $2\frac{1}{2}$ yards of flannel cost $3\frac{1}{3}$*s.*, what is the price of $4\frac{3}{4}$ yards?
18. If $\frac{3}{16}$ of a ship cost $273\frac{1}{8}$*l.*, what is $\frac{5}{12}$ of her worth?
19. If $\frac{5}{8}$ of a cwt. cost $4\frac{7}{9}$*l.*, what will $4\frac{1}{2}$ lbs. cost
20. If 1 lb. of coffee cost $2\frac{3}{4}$*s.*, how many pounds can I have for $38\frac{1}{2}$*s.*?
21. If $7\frac{5}{8}$ yards cost 7*l.* 18*s.* 4*d.*, how much did 49 yards come to?

DECIMAL FRACTIONS.

A **Decimal Fraction** is a fraction whose denominator is 10, 100, 1000, &c., or a unit with as many ciphers annexed to it as there are figures in the numerator. Thus, $\frac{5}{10}$, $\frac{25}{100}$, $\frac{325}{1000}$, are decimal fractions, and are usually written in this manner: ·5, ·25, ·325, the numerators being omitted; but a point is placed on the left hand to distinguish them from integers. In reading them the first is called 5-tenths, the second 25-hundredths, and the third 325-thousandths.

When there are not so many figures in the numerator as there are ciphers in the denominator, as many ciphers as are necessary must be prefixed; thus, $\frac{3}{100}$=·03, and $\frac{3}{1000}$=·003.

Ciphers on the left hand of a decimal *decrease* its value tenfold: thus, ·5 is 5-tenths; ·05 is 5-hundredths, and ·005 is 5-thousandths. Ciphers on the right do not alter the value, for ·5, ·50, ·500, are the same as $\frac{5}{10}$, $\frac{50}{100}$, $\frac{500}{1000}$, and these are of equal value.

ADDITION.

Rule.—Place the numbers to be added so that the decimal points be directly under each other, and add as in Simple Addition. Insert the point in the answer directly under the other points.

Add together the following numbers :—

(1)	(2)	(3)
2·13	43·27	820·71
·426	9·042	2·006
21·2	712·417	84·243
7·63	41·007	217·072
640·072	·962	9·341

4 Add 4·281, 72·32, 920·74, ·9374, 876·05.
5 723·312, 91·0006, 2·0251, 3724·7, ·00007.
6 87·214, ·736, 7213·04, 123·476, 21·6743.
7 800·273, 498·0009, ·296, ·0071, 4260·008.
8. 720·492, ·23687, 970·0053, 9·086, 41·762.

SUBTRACTION.

Rule.—Place the numbers as in addition; subtract as in simple numbers, and insert the point under the other points.

1. From 72·378 take 4·861
2. 9·007 ·962
3. 41·217 7·0968
4. 298·012 ·9999
5. 840·001 170·98
6. From 279·712 take 97·0076
7. 72·0076 1·978
8. 900·005 89·1171
9. 243·21 ·964218
10. 462·0068 134·791

MULTIPLICATION.

Rule.—Arrange the factors, and multiply as in whole numbers. Reckon the number of decimals in both factors and point off as many from the right of the product. When the number of figures in the product is not so many as the number of decimals in both factors, as many ciphers as may be necessary to make up the deficiency must be placed at the left of the product.

Multiply 7·4 by ·35.

```
 7·4
 ·35
----
 370
222
----
2·590
```

In the above example there are three decimal places in the multiplicand and multiplier: therefore three figures are pointed off from the right of the product.

Multiply ·045 by ·03

```
  ·045
   ·03
------
·00135
```

In the above example there are five decimal places in the factors, and only three figures in the product; therefore two ciphers are placed at the left of the product to make the number of decimal places in the product equal to those in the factors.

1. Mult.	·27 by	·27
2.	4·21	3·41
3.	97·04	80·03
4.	·4102	·1004
5.	·700	·806
6.[*]	·879	10
7. Mult.	2300·7 by	48·003
8.	704·23	·0007
9.	·786	100
10.	4·862	·75
11.	200·03	·002
12.	·00076	1000

DIVISION.

Rule.—Divide as in whole numbers. Point off as many decimal places in the quotient as the dividend has more than the divisor: if necessary, place ciphers to the left of the quotient.

If the divisor has more figures than the dividend, add ciphers to the right of the dividend.

When there is a remainder, the quotient may be carried to any degree of exactness, by annexing ciphers to the remainder.

Divide 4·7614 by 3·8.

3·8)4·7614(1·253

In this case the decimals in the dividend exceed those in the divisor by three; three figures are therefore marked off in the quotient.

Divide ·7644 by 42.

42)·7644(·0182

In this case the decimals in the dividend exceed those in the divisor by four; a cipher is therefore prefixed in the quotient to make four decimal places.

1. Divide	6·74 by	2·34
2.	4·96	·278
3.	7·6	·734
4.	7·23	4·06
5.	0·24	·001
6.[†]	29·6	10
7. Divide	724·1 by	38·07
8.	82·03	9·0002
9.	7·624	2·001
10.	·5218	·24121
11.	31	·124689
12.	3468·9	1000

---

[*] In order to multiply a decimal by 10, remove the point one figure to the *right;* if by 100, remove it two places, and so on.

[†] To divide by 10, 100, &c., remove the decimal place of the dividend as many places to the *left* as there are ciphers.

REDUCTION.

CASE I.—*To reduce a vulgar fraction to a decimal.*

RULE.—Divide the numerator by the denominator; annexing as many ciphers to the numerator as may be necessary. Point off as many decimal places in the quotient as there were ciphers annexed to the numerator.

Reduce $\frac{1}{2}$ to a decimal.

$2)\underline{10}$

·5 *Ans.*

Reduce $\frac{3}{4}$ to a decimal.

$4)\underline{300}$

·75 *Ans.*

1. Reduce $\frac{5}{8}$ to a decimal.
2. $\frac{1}{4}$
3. $\frac{7}{8}$
4. $\frac{1}{3}$
5. $\frac{5}{6}$
6. $\frac{1}{6}$
7. Reduce $\frac{9}{16}$ to a decimal
8. $\frac{1}{75}$
9. $\frac{16}{17}$
10. $\frac{8}{11}$
11. $\frac{275}{3842}$
12. $\frac{1}{1875}$

CASE II.—*To reduce a decimal to a vulgar fraction.*

RULE.—Make the given decimal the numerator, and place under it, for a denominator, a unit with as many ciphers as there are figures in the decimal.

Reduce ·5 to a vulgar fraction.

$\frac{5}{10}$ *Ans.*

Reduce ·078 to a vulgar frac

$\frac{78}{1000}$ *Ans.*

1. Reduce ·25 to a vulgar frac.
2. ·625
3. ·375
4. ·005
5. ·01
6. Reduce ·001 to a vulg. frac.
7. ·41
8. ·021
9. ·007
10. ·019

CASE III.—*To reduce numbers of a lower denomination to the decimal of a higher.*

RULE.—Write the given numbers, if more than one, directly under each other, beginning with the lowest, and divide by as many of the lower as make one of the higher, annexing ciphers if necessary.

Reduce 12*s.* 3*d.* to the decimal of a pound.

$$\begin{array}{r} 12\underline{)\ 3{\cdot}00} \\ 20\underline{)12{\cdot}250} \\ {\cdot}6125 \text{ } \textit{Ans.} \end{array}$$

Here the shillings and pence are placed under each other, beginning with the lower; and each divided by as many of the lower as make one of the higher.

Reduce 16*s.* 6¾*d.* to the decimal of a pound.

$$\begin{array}{r} 4\underline{)\ 3{\cdot}00} \\ 12\underline{)\ 6{\cdot}7500} \\ 20\underline{)16{\cdot}56250} \\ {\cdot}828125 \text{ } \textit{Ans.} \end{array}$$

Here the farthings, pence, and shillings are placed under each other, beginning with the lowest; each is then divided by as many of the lower as make one of the higher.

1. Reduce 19*s.* 5½*d.* to the decimal of a pound.
2. Reduce 15*s.* 9¾*d.* to the decimal of a pound.
3. Reduce 13*s.* 4*d.* to the decimal of a pound.
4. Reduce 9*d.* to the decimal of a pound.
5. Reduce 3 cwt. 2 qrs. 8 lbs. to the decimal of a cwt.
6. Reduce 4 feet 3 inches to the decimal of a yard.
7. Reduce 26 min. 34 sec. to the decimal of a week.
8. Reduce 5 furlongs 2 poles to the decimal of a mile.
9. Reduce 4¾*d.* to the decimal of a guinea.
10. Reduce 5 dwt. 12 grs. to the decimal of an ounce.
11. Reduce 2 roods 12 perches to the decimal of an acre.
12. Reduce 17 yards, 1 foot, 6 inches, to the decimal of a mile.

CASE IV.—*To find the value of a decimal.*

RULE.—Multiply the decimal by as many of the ne lower denomination as make one of the given denominatio Point off, from the product, as many decimal places as a in the given decimal. Proceed thus to the lowest denom nation. The figures on the left of the points are the valu of the decimal.

What is the value of ·427 of a pound?

·427
20
8·540
12
6·480
4
1·920

Ans. 8*s.* 6¼*d.*

What is the value of ·24 of a day?

·243
24
5·832
60
49·920
60
55·200

Ans. 5 hrs. 49 min. 55 sec

1. What is the value of ·7634*l.*?
2. What is the value of ·3412*l.*?
3. What is the value of ·0076*l.*?
4. What is the value of ·764 cwt.?
5. What is the value of ·936 lb. avoirdupois?
6. What is the value of ·007 ton?
7. What is the value of ·732 shilling?
8. What is the value of ·079 crown?
9. What is the value of ·9218 day?
10. What is the value of ·496 yard?
11. What is the value of ·0796 mile?
12. What is the value of ·732 lb. troy?
13. What is the value of ·987 oz. avoirdupois?
14. What is the value of ·987 oz. troy?
15. What is the value of ·779 lb avoirdupois?

INVOLUTION.

When a number is multiplied by itself, the product is called the power, and the number multiplied the root. Thus, 2×2=4: here 4 is the square or second power of the root 2. Again, 2×2×2=8: here 8 is the cube or third power of the root 2. Again, 2×2×2×2=16: here 16 is the fourth power of the root 2.

1. Find the second power of 8.
2. Required the third power of 13.
3. Raise 32 to the fourth power.
4. Involve 19 to the fifth power.
5. Involve 33 to the sixth power.

EVOLUTION.

EVOLUTION is the method of finding the roots of numbers.

EXTRACTION OF THE SECOND OR SQUARE ROOT.

To extract the square root of any given number is to find a number which, when multiplied by itself, will produce the given number.

What is the square root of 106929?

RULE WITH EXAMPLE. — Divide the given number into periods of two figures each, by placing a point over the unit figure, and over every alternate figure towards the left. Find the square root, 3, of the first period, 10, and place it in the quotient. Subtract the square of it, 9, from the first period, and to the remainder annex the next period, 69,

```
         1̇069̇2̇9(327
          9
         ----
   62)   169
         124
         -----
  647)   4529
         4529
         ----
```

for a dividend. Double the root already found, 3, for a d visor, and supposing the unit figure, 9, omitted, find bo often it, viz. 6, is contained in the dividend. It is containe 2 times; place the 2 then *both* in the quotient and the d visor. Multiply by it, 2, the divisor, 62, and subtract th product, 124, from the dividend. Bring down another pe riod, and proceed thus till all the periods are brought dow

If there be a remainder after all the periods ar used, periods of ciphers may be annexed; when th result will be decimals. Should there be decima in the given number, still the pointing is to begi from the units' place of the *integers*, and a poin to be placed over every alternate figure both rig and left.

The square root of a fraction is found by extracting th square root of the numerator for a new numerator, and th root of the denominator for a new denominator; if, howeve this cannot be done, let the fraction be reduced to a de mal and the root extracted as before.

1. What is the square root of 30976 ?
2. What is the square root of 622521 ?
3. What is the square root of 1234321 ?
4. What is the square root of 2052·09 ?
5. What is the square root of 4795·25731 ?
6. What is the square root of 24674·1264
7. What is the square root of $\frac{49}{144}$?
8. What is the square root of [illegible] ?

EXTRACTION OF THE THIRD OR CUBE ROOT

To extract the Cube Root of any given numbe is to find a number which, when multiplied twice b itself, will produce the given number.

Find the cube root of 12812904.

Rule with Example.—Divide the given number into periods of three figures, beginning at the place of units. Place the cube root of the first period, 2, in the quotient, and subtract its cube, 8, from the first period, and bring down the next period for a dividend, which is 4812; to find a divisor, multiply the square of the figure placed in the quotient by 300=1200; find how often this is contained in the dividend, viz. 3 times; place the 3 in the quotient for the second figure of the root. Multiply the part of the root formerly found, viz. 2, by the last figure placed in the root, viz. 3, and the product by 30=180; add this, and the square of the last figure placed in the root to the divisor, viz. 1200; multiply the sum of these, 1389, by the last figure placed in the root, 3, and subtract the product, 4167, from the dividend, 4812; bring down another period for a new dividend, and proceed in the same manner.

$$\begin{array}{lrr}
 & & 12812904(284 \\
 & & 8 \\
\hline
 & & 4812 \\
2\times2=4\times300= & 1200 & \\
2\times3=6\times\ 30= & 180 & \\
3\times3 = & 9 & \\
\hline
 & 1389\times3= & 4167 \\
\hline
 & & 645904 \\
23^2\times300 = & 158700 & \\
23\times4\times30= & 2760 & \\
4^2 = & 16 & \\
\hline
 & 161476\times4= & 645904 \\
\hline
 & & 0
\end{array}$$

In order to extract the cube root of a vulgar fraction, reduce it to a decimal, and then extract the root.

In mixed numbers, reduce the fractional part to a decimal.

Find the cube root of the following numbers:

1. Of 373248
2. — 54872
3. — 389017
4. — 1092727
5. — 84604519
6. Of 52734·375
7. — 7834·8748
8. — ·053157376
9. — $\frac{4}{7}$
10. — $7\frac{1}{8}$

DUODECIMAL MULTIPLICATION.

This rule is made use of by artificers in mea ing their work. The dimensions are taken in f inches, and parts. The foot is divided into parts, called inches; the inch into 12 parts, ca seconds; the seconds into 12 parts, called thir and the thirds into 12 parts, called fourths. Th seconds are marked thus, 3″; thirds, thus, 3‴; fourths, thus, 4⁗.

Multiply 7 feet 6¾ inches by 2 feet 5¼ inches.

ft.	*in.*	″		
7	6	9*		
2	5	3		
15	1	6		
8	1	9	9	
	1	10	8	3
18	5	2″	5‴	3

Rule with Example.—Place the multiplier under the multiplicand, feet under feet, inches under inches, &c. Multiply the multiplicand, beginning at the lowest term, 9, by the highest term in the multiplier, 2, carrying by 12; then multiply by the next lower term in the multiplier, viz. 5 inches, taking care, however, to put the product one place towards the hand. Do the same with the next lower term, and Add the different products together.

1. Multiply 7 feet 9 inches, by 5 feet 6 inches.

2. Multiply 9 feet 5 inches 3″, by 4 feet 8 inches 8″

3. Multiply 12 feet 8 inches 7″, by 3 feet 4 inches 9

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[*] Instead of ¾ inches 9″ are put down, because they are equi The same is done with the ¼ inch.

. Multiply 46 feet 11 inches 8″, by 12 feet 7″

. Multiply 87 feet 9½ inches, by 11 feet 10¼ inches.

. Multiply 687 feet 7¾ inches, by 24 feet 10½ inches.

find the superficial content, multiply the length by the breadth.

. Find the content of a board 8 feet 4 inches long, and et 4 inches broad.

. Find the area of a table 10 feet 9 inches long, and f 4 inches broad.

. What is the price of a marble slab, the length of which feet 4 inches, the breadth 3 feet 2 inches, at 7*s.* per ?

0. Required the area of a square, the side of it being 23 9 inches.

1. A grave-stone was charged at 5*s* 2*d.* per foot; what the price of it, the length of it being 7 feet 2 inches, the adth 3 feet 6 inches ?

2. How much will it cost to pave a court-yard, at 7*s.* 8*d.* foot, the length of it being 26 feet 9 inches, the breadth feet 4 inches ?

find the solid content, multiply the length, breadth, and thickness together.

3. What is the solid content of a block of marble 9 feet nches long, 5 feet 8 inches broad, and 2 feet 3 inches k ?

4. Required the solid content of a box 6½ feet long, 4¾ t broad, and 3¼ feet deep.

15. A log of mahogany is 72 feet 7½ inches long, 5 fe
6¼ inches broad, and 8 feet 6½ inches thick; required i
solid content.

16. What would it cost to have a cellar dug 18 feet
nches long, 12 feet 9 inches broad, and 9 feet 6 inches dee
t 6d. per solid yard?

17. Required the solid content of a log of beech, 27 fee
inches long, 2 feet 5 inches broad, and 1 foot 2 inche
thick.

18. What is the value of a block of granite 8 feet 9 inche
long, 3 feet 7 inches broad, and 4 feet 2 inches thick, at 7
8d. the solid foot?

MENTAL ARITHMETIC.

1.—*To find the value of* 12 *articles, the price of one being given.*

RULE.—Reckon every penny in the price a shilling, and every farthing three pence.

Because the value of 12 articles at 1*d.* each is 12*d.*, or 1*s.*

				Ans.
12	at	6*d.*	each	6*s.*
12	—	8*d.*	—	8*s.*
12	—	13*d*	—	13*s.*
12	—	4¼*d.*	—	4*s.* 3*d.*
12	—	5½*d.*	—	5*s.* 6*d.*
12	—	7¾*d.*	—	7*s.* 9*d.*
12	—	15¼*d.*	—	15*s.* 3*d.*
12	—	16½*d.*	—	16*s.* 6*d.*
12	—	17¾*d.*	—	17*s.* 9*d.*
12	—	19½*d.*	—	19*s.* 6*d.*
120	—	3*d.*	—	30*s.*
20*	—	7*d.*	—	70*s.*
240	—	8*d.*	—	160*s.*
360	—	7*d.*	—	210*s.*
480	—	9*d.*	—	360*s.*
600	—	11*d.*	—	550*s.*

				Ans.
24	at	7*d.*	each	14*s.*
24	—	6¼*d.*	—	12*s.* 6*d.*
36	—	9*d.*	—	27*s.*
36	—	10½*d.*	—	31*s.* 6*d.*
12	—	1*s.* 4¼*d.*	—	16*s.* 3*d.*
12	—	1*s.* 7¾*d.*	—	19*s.* 9*d.*
24	—	1*s.* 3*d.*	—	30*s.*
24	—	2*s.* 1*d.*	—	50*s.*
48	—	1*s.* 3*d.*	—	60*s.*
72	—	1*s.* 8*d.*	—	120*s.*
720	—	5*d.*	—	300*s.*
840	—	7*d.*	—	490*s.*
960	—	6*d.*	—	480*s.*
1080	—	7*d.*	—	630*s.*
1200	—	8*d.*	—	800*s.*
1320	—	9*d.*	—	990*s.*

When there are a few over or under the dozen, calculate for a dozen, and add or subtract as may be required.

				Ans.
13	at	4*d.*	each	4*s.* 4*d.*
14	—	5*d.*	—	5*s.* 10*d.*
11	—	6*d.*	—	5*s.* 6*d.*
10	—	6*d.*	—	5*s.*
9	—	8*d.*	—	6*s.*
15	—	10*d.*	—	12*s.* 6*d.*

				Ans.
25	at	4*d.*	each	8*s.* 4*d*
26	—	9*d.*	—	19*s.* 6*d*
23	—	3*d.*	—	5*s.* 9*d.*
22	—	7*d.*	—	12*s.* 10*d.*
37	—	1*s.* 3*d.*	—	46*s.* 3*d.*
35	—	1*s.* 4*d.*	—	46*s.* 8*d.*

In this case find the answer for one dozen, and take it ten times.

II.—*To find the price of a gross, the price of one article being given.*

RULE.—Reckon the pence in the price of one article as shillings, and the number of pence in these shillings will be the price of a gross in shillings.

Because taking the pence in the price as shillings is the same as multiplying by 12, and taking these shillings as pence again is the same as multiplying by 12 another time, and 12×12=144=1 gross.

	Ans.		*Ans.*
1 gross at 4*d* each	48*s*.	1 gross at 8¼*d*. each	99*s*.
1 — — 2½*d*. —	30*s*.	1 — — 9½*d*. —	114*s*.
1 — — 3¼*d*. —	39*s*.	1 — — 11¾*d*. —	141*s*.
1 — — 7¾*d*. —	93*s*.	1 — — 12¼*d*. —	147*s*

III.—*To find the price per score, the price of one article being given.*

RULE.—Reckon a pound for every shilling in the price. Thus, there being 20 cwt. in a ton, the price of 1 ton at 7*s* 6*d*. per cwt. is 7*l*. 10*s*.

	Ans.		*Ans.*
20 lbs. at 4*s*. per lb.	4*l*.	*200 lbs. at 6*s*. per lb.	60*l*.
20 — — 5*s*. 6*d*. —	5*l*. 10*s*.	200 — — 5*s*. 6*d*. —	55*l*.
40 — — 6*s*. 3*d*. —	12*l*. 10*s*.	400 — — 7*s*. 3*d*. —	145*l*.
60 — — 2*s*. 3*d*. —	6*l*. 15*s*.	600 — — 9*s*. 9*d*. —	292*l*. 10*s*
80 — — 4*s*. 6*d*. —	18*l*.	800 — — 12*s*. —	480*l*.
100 — — 5*s*. 3*d*. —	26*l*. 5*s*.	1000 — — 2*s*. 3*d*. —	112*l*. 10*s*

IV.—*To find the value of 100 articles, the price of one being given*

RULE.—For every farthing in the price, take as many pence, and twice as many shillings. Thus, 100 pencils at 1½*d*. each is 12*s*. 6*d*., 6 being the number of farthings.

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* In this case find the value of one score, and take it ten times for the answer.

Because, by taking a penny for every farthing is the same as multiplying by 4, and taking 2 shillings for every farthing is the same as multiplying by 96, and 96+4=100.

				Ans.					Ans.
100	at	2*d.*	each	16*s.* 8*d.*	100	at	4½*d.*	each	37*s.* 6*d*
100	—	2¼*d.*	—	18*s.* 9*d.*	100	—	5¾*d.*	—	47*s.* 11*d.*
100	—	3½*d.*	—	29*s.* 2*d.*	100	—	6¼*d.*	—	52*s.* 1*d.*

V.—*To find the price of one article, the rate per dozen being given.*

Rule.—Reckon a penny for every shilling in the rate per dozen.

				Ans.					Ans.
1	at	12*s.*	per doz.	12*d.*	1	at	4*s.* 3*d.*	per doz.	4¼*d.*
1	—	4*s.*	—	4*d.*	1	—	7*s.* 6*d.*	—	7½*d.*
1	—	7*s.*	—	7*d.*	1	—	10*s.* 9*d.*	—	10¾*d.*
1	—	13*s.*	—	13*d.*	2	—	4*s.* 3*d.*	—	8½*d.*
1	—	14*s.*	—	14*d.*	3	—	7*s.* 6*d.*	—	22½*d.*
1	—	18*s.*	—	18*d.*	6	—	8*s.*	—	4*s.*
2	—	6*s.*	—	12*d.*	13	—	9*s.*	—	9*s.* 9*d.*
3	—	8*s.*	—	24*d.*	11	—	7*s.*	—	6*s.* 5*d.*

VI.—*To find the price of one article, the price per gross being given.*

Rule.—Reckon the shillings of the price as pence, and divide them by 12.

Because taking the shillings as pence and dividing them by 12, is equal to dividing twice by 12, or 144.

				Ans.					Ans.
1	at	48*s.*	per gross	4*d.*	1	at	99*s.*	per gross	8¼*d.*
1	—	30*s.*	—	2½*d.*	1	—	114*s.*	—	9½*d.*
1	—	39*s.*	—	3¼*d.*	1	—	141*s.*	—	11¾*d.*
1	—	93*s.*	—	7¾*d.*	1	—	147*s.*	—	12¼*d.*

VII.—*To find the value of a single article at a certain rate per score.*

RULE.—Reckon a shilling for every pound in the price.

	Ans.		Ans.
1 at 4*l.* per score	4*s.*	2 at 4*l.* 5*s.* per sc're	8*s.* 6*d.*
1 — 9*l.* —	9*s.*	1 — 7*l.* 7*s.* 6*d.* —	7*s.* 4½*d.*
1 — 9*l.* 10*s.* —	9*s.* 6*d.*	1 — 6*l.* 17*s.* 6*d.* —	6*s.* 10½*d.*
1 — 14*l.* 15*s.* —	14*s.* 9*d.*	1 — 3*l.* 13*s.* 4*d.* —	3*s.* 8*d.*
1 — 27*l.* 5*s.* —	27*s.* 3*d.*	1 — 7*l.* 6*s.* 8*d.* —	7*s.* 4*d.*
1 — 30*l.* 15*s.* —	30*s.* 9*d.*	21 — 2*l.* 10*s.* —	2*l.* 12*s.* 6*d.*
4 — 35*l.* 15*s.* 10*d.* —	7*l.* 3*s.* 2*d.*	40 — 8*l.* 17*s.* 4*d.* —	17*l.* 14*s.* 8*d.*
5 — 36*l.* 16*s.* 8*d.* —	9*l.* 4*s.* 2*d.*	60 — 3*l.* 15*s.* 2¼*d.* —	11*l.* 5*s.* 6¾*d.*
10 — 42*l.* 18*s.* 6*d.* —	21*l.* 9*s.* 3*d.*	80 — 2*l.* 5*s.* 1*d.* —	9*l.* 0*s.* 4*d.*

VIII.—*To find the value of any number of articles when the price is given in pence or shillings.*

RULE.—If the price be in pence, consider the number of articles as pence, and multiply by the pence in the price. If the price be in shillings, consider the number of articles as shillings, and multiply by the shillings in the price. Thus, 96 articles at 3*d.* each is 24*s.*, because 96 pence is 8*s.*, and 8×3=24. Again, 80 articles at 3*s.* each is 12*l.*, because 80*s.* is 4*l.*, and 4×3=12.

	Ans.		Ans.
36 at 3*d.* each	9*s.*	40 at 8*s.* each	6*l.*
60 — 5*d.* —	25*s.*	100 — 7*s.* —	35*l.*
120 — 7*d.* —	70*s.*	140 — 10*s.* —	70*l.*
144 — 8*d.* —	96*s.*	300 — 8*s.* —	120*l.*
54 — 6*d.* —	27*s.*	180 — 12*s.* —	108*l.*
66¼ — 4*d.* —	22*s.* 1*d.*	900 — 6*s.* —	270*l.*
100½ — 8*d.* —	67*s.*	86 — 10*s.* —	43*l.*
58¾ — 9*d.* —	44*s.* 0¾*d.*	165 — 4*s.* —	33*l.*

IX.—*To find what any number of pence per day will amount to in a year.*

RULE.—Add together as many pounds, half-pounds, fourpences, and pence as there are pence per day. Thus, 3*d.* per day is 3 pounds, 3 half-pounds, 3 four-pences and 3 pence in a year; that is, 4*l.* 11*s.* 3*d.*

Because 1*l.*=240*d.*, 10*s.*=120*d.*, 4*d.* and 1*d.*
And 240+120+4+1=365.

Or, take 365 as pence; that is, 1*l.* 10*s.* 5*d.*, and multiply this by the number of pence per day.

			Ans.
365 days at	2*d.*	per day	3*l.* 0*s.* 10*d.*
365 ——	4*d.*	——	6*l.* 1*s.* 8*d.*
365 ——	5*d.*	——	7*l.* 12*s.* 1*d.*
365 ——	6*d.*	——	9*l.* 2*s.* 6*d.*
365 ——	7*d.*	——	10*l.* 12*s.* 11*d.*
365 ——	8*d.*	——	12*l.* 3*s.* 4*d.*
365 ——	9*d.*	——	13*l.* 13*s.* 9*d.*
365 ——	10*d.*	——	15*l.* 4*s.* 2*d.*
365 ——	16*d.*	——	24*l.* 6*s.* 8*d.*
365 ——	18*d.*	——	27*l.* 7*s.* 6*d.*
*½ year at	14*d.*	——	10*l.* 12*s.* 11*d.*
¼ ——	20*d.*	——	7*l.* 12*s.* 1*d.*

X.—*To find what any number of pence per day will amount to in 313 days, which, omitting Sundays, is the number of days in a year.*

RULE.—Add together as many pounds, crowns, shillings, and pence, as there are pence per day. Thus, 3 pence per day is 3 pounds, 3 crowns, 3 shillings, and 3 pence per year of 313 days; that is, 3*l.* 18*s.* 3*d.*

Because 1*l.*=240*d.*, 1 crown=60*d.*, 1*s.*=12*d.*, 1*d.*
240 + 60 + 12+1=313.

Or, multiply 1*l.* 6*s.* 1*d.*=313*d.* by the number of pence per day.

---

* In this case take half the number of pence per day, and calculate for a whole year.

				Ans.
313	days at	2*d.*	per day	2*l.* 12*s.* 2*d.*
313	——	3*d.*	——	3*l.* 18*s.* 3*d.*
313	——	6*d.*	——	7*l.* 16*s.* 6*d.*
313	——	7*d.*	——	9*l.* 2*s.* 7*d.*
313	——	13*d.*	——	16*l.* 19*s.* 1*d.*
313	——	14*d.*	——	18*l.* 5*s.* 2*d.*
313	——	20*d.*	——	26*l.* 1*s.* 8*d.*
313	——	60*d.*	——	78*l.* 5*s.* 0*d.*

Should there be farthings in the rate per day, add f every farthing in the rate 7*s.* 7¼*d.* for 365 days, and 6*s.* 6¼ for 318 days.

Because 7*s.* 7¼*d.*=365 farthings, and 6*s.* 6¼*d.*=313 fa hings.

				Ans.
365	days at	2¼*d.*	per day	3*l.* 8*s.* 5¼*d.*
365	——	3¼*d.*	——	4*l.* 18*s.* 10¼*d.*
365	——	6½*d.*	——	9*l.* 17*s.* 8½*d.*
313	——	2¼*d.*	——	2*l.* 18*s.* 8¼*d.*
313	——	3¼*d.*	——	4*l.* 4*s.* 9¼*d.*
313	——	6½*d.*	——	8*l.* 9*s.* 6½*d.*

XI.—*To find what any number of shillings per week wi amount to in a year.*

Rule.—Add together twice and half as many pounds, an twice as many shillings, as there are shillings per wee Thus, 6*s.* per week is 15*l.* 12*s.*; for twice as many pound is 12*l.*, and half as many pounds is 3*l.*, and twice as man shillings is 12*s.*, and 12*l.*+3*l.*+12*s.*=15*l.* 12*s.*

Because 52, the number of weeks in a year, is equal t 20+20+10+2.

				Ans.					Ans.
1	year at	4*s.*	per wk.	10*l.* 8*s.*	1	year at	10*s.*	per wk.	26*l.*
1	——	5*s.*	——	13*l.*	1	——	11*s.*	---	28*l.* 12
1	——	6*s.*	——	15*l.* 12*s.*	1	——	12*s.*	——	31*l.* 4
1	——	7*s.*	——	18*l.* 4*s.*	1	——	16*s.*	——	41*l.* 12
1	——	8*s.*	——	20*l.* 16*s.*	1	——	17*s.*	——	44*l.* 4
1	——	9*s.*	——	23*l.* 8*s.*	1	——	19*s.*	——	49*l.* 8

XII.—*To find what any number of pence per week will amount to in a year.*

Rule.—Take 4 times as many shillings and 4 times as many pence as there are pence per week, and if there be farthings in the rate add 1*s.* 1*d.* for every farthing.

Because 52*d.*=4*s.* 4*d.*, and 52 farthings=13*d.* or 1*s.* 1*d.*

			Ans.				Ans.
1 year at	2*d.*	per week	8*s.* 8*d.*	1 year at	2¼	per wk.	9*s.* 9*d.*
1 ——	3*d.*	——	13*s.*	1 ——	3½*d*	——	15*s.* 2*d.*
1 ——	4*d.*	——	17*s.* 4*d.*	1 ——	4¼*d*	——	18*s.* 5*d.*
1 ——	7*d.*	——	30*s.* 4*d.*	1 ——	7¾*d*	——	33*s.* 7*d.*
1 ——	9*d.*	——	39*s.*	1 ——	9½*d*	——	41*s.* 2*d.*
1 ——	11*d.*	——	47*s.* 8*d.*	1 ——	11¾*d*	——	50*s.* 11*d.*

XIII.—*To find the value of a pound, the price per ounce being given.*

Rule.—If it be a pound avoirdupois, divide the farthings in the price per oz. by 3, for the answer in shillings; if it be a pound troy, divide by 4.*

Because, taking the farthings as shillings is multiplying by 48; now 48÷3=16 oz. in lb. avoirdupois; and 48÷4=12 lb. troy.

1 lb. avo. at	1½*d.*	per oz.	2*s.*	1 lb. troy at	4*d.*	per oz.	4*s.*
1 ——	2*d.*	——	2*s.* 8*d.*	1 ——	2½*d.*	——	2*s.* 6*d.*
1 ——	3*d.*	——	4*s.*	1 ——	6¾*d.*	——	6*s.* 9*d.*
1 ——	5*d.*	——	6*s.* 8*d.*	1 ——	7¼*d.*	——	7*s.* 3*d.*
1 ——	7½*d.*	——	10*s.*	1 ——	9½*d.*	——	9*s.* 6*d.*
1 ——	10¾*d.*	——	14*s.* 4*d.*	1 ——	11¾*d.*	——	11*s.* 9*d.*

XIV.—*To find the value of an ounce, the price per pound being given.*

Rule.—If it be an ounce avoirdupois, take the shillings as farthings and multiply by 3; if it be an ounce troy, multiply by 4.

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* This mode of finding the value of a lb. troy is put here merely to show the principle of the rule. It is, of course, better to find its value by Case 1.

Because, taking the shillings as farthings is equal to dividing by 48 instead of 16; therefore we multiply by 3, for 16×3=48; and in the case of troy weight we multiply by 4, for 12×4=48.

				Ans.					*Ans.*
1 lb. avoir	at	2s.	per lb.	1½d.	*1 oz. troy	at	2s.	per lb.	2d.
1	——	1s.	—	0¾d.	1	——	1s.	—	1d.
1	——	3s.	—	2¼d.	1	——	3s.	—	3d.
1	——	6s.	—	4½d.	1	——	6s.	—	6d.
1	——	9s.	—	6¾d.	1	——	9s.	—	9d.
1	——	10s.	—	7½d.	1	——	10s.	—	10d.

XV.—*To find the value of a hundred weight, or 112 lbs., the price per lb. being given.*

RULE.—Take 9 times as many shillings and 4 times as many pence, as there are pence in the price per lb.

Because 9s. 4d.=112d.

				Ans.					*Ans.*
1 cwt.	at	2d.	per lb.	18s. 8d.	1 cwt.	at	7d.	per lb.	65s. 4d.
1	——	3d.	—	28s.	1	——	8d.	—	74s. 8d.
1	——	6d.	—	56s.	1	——	9d.	—	84s.
1	——	4d.	—	37s. 4d.	1	——	10d.	—	93s. 4d.
1	——	5d.	—	46s. 8d.	1	——	11d.	—	102s. 8d.
1	——	1d.	—	9s. 4d.	1	——	12d.	—	112s.

XVI.—*To find the value of a pound, the price per cwt. being given.*

RULE.—Multiply the shillings in the price by 3 and divide by 7 for the price of a pound in farthings.

Because taking the shillings as farthings is the same as dividing by 48, and dividing by 48 and by 7, and multiplying by 3, is the same as dividing by 112.

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* Better to do this by Case II.

	Ans.		Ans.
b. at 7s. per cwt.	0¾d.	1 lb. at 3l. per cwt.	6¼d.+
1 — 9s. ——	0¾d.+	1 — 3l. 10s. ——	7½d.
1 — 11s. ——	1d.+	1 — 4l. 9s. ——	9½d.+
1 — 1l. 5s. ——	2½d.+	1 — 5l. 15s. ——	12¼d.+
1 — 2l. 6s. ——	4¾d.+	1 — 10l. 8s. ——	22¼d.+

XVII.—*To find the value of a ton, the price per lb. being given.*

Rule.—Find the value of 1 cwt. by Case XV., and take shillings in the price of a cwt. as pounds. For every 4d. add 6s. 8d.

	Ans.		Ans.
1 ton at 1d. per lb.	9l. 6s. 8d.	1 ton at 7d. per lb.	65l. 6s 8d.
1 — 3d. —	28l.	1 — 8d. —	74l. 13s 4d.
1 — 6d. —	56l.	1 — 9d. —	84l.
1 — 2d. —	18l. 13s. 4d.	1 — 10d. —	93l. 6s 8d.
1 — 4d. —	37l. 6s. 8d.	1 — 11d. —	102l. 13s. 4d.
1 — 5d. —	46l. 13s. 4d.	1 — 12d. —	112l.

XVIII.—*To find the interest or discount upon any sum at 5 per cent. per annum.*

Rule.—Reckon a shilling for every pound, and 3d. for every 5s.

	Ans.		Ans.
12l. at 5 per cent.	12s.	26l. 5s. at 5 p. ct.	1l. 6s. 3d.
42l. ———	42s.	47l. 10s. ———	2l. 7s. 6d.
68l. ———	3l. 8s.	69l. 15s. ———	3l. 9s. 9d.
75l. ———	3l. 15s.	87l. 5s. ———	4l. 7s. 3d.
110l. ———	5l. 10s.	99l. 15s. ———	4l. 19s. 9d.
98l. ———	4l. 18s.	108l. 10s. ———	5l. 8s. 6d.

XIX.—*To find the interest on any sum at 5 per cent. per annum for months.*

Rule.—Take the pounds as pence, and multiply these pence by the number of months, for the answer in pence.

Int. on		Ans.	Int. on		Ans.
4*l.*	for 2 months	8*d.*	84*l.*	for 4 mths.	28*s.*
7*l.*	— 3 —	21*d.*	96*l.* 5*s.*	— 3 —	24*s.* 0¾*d*
4*l.* 5*s.*	— 2 —	8½*d.*	108*l.* 15*s.*	— 6 —	54*s.* 4½*d*
9*l.* 10*s.*	— 3 —	28½*d.*	120*l.* 10*s.*	— 7 —	70*s.* 3½*d*
60*l.*	— 7 —	35*s.*	132*l.* 5*s.*	— 8 —	88*s.* 2*d.*
72*l.*	— 9 —	54*s.*	144*l.* 15*s.*	— 9 —	108*s.* 6¾*d*

XX.—*To find the interest on any sum at 5 per cent. for any number of days.*

RULE.—Multiply either the money or the days by one third of the money or the days; reject the unit figure, and you have the answer in pence. Thus, the interest of 27*l.* for 18 days: 27×6=162=16*d.*; or 18×9=162=16*d.* interest.

Int. on		Ans.	Int. on		Ans.
21*l.*	for 6 days	4*d.*	76*l.*	for 6 days	15*d.*
24*l.*	— 7 —	5½*d.*	85*l.*	— 15 —	42½*d.*
33*l.*	— 9 —	9¾*d.*	99*l.*	— 18 —	59½*d.*
41*l.*	— 12 —	16¼*d.*	159*l.*	— 27 —	143*d.*

XXI.—*To find the interest on any sum at 6 per cent. for months.*

RULE.—Multiply the pounds and months; cut off the unit figure of the product, and the remainder will be the interest in shillings. The figure cut off is tenths of a shilling. Thus, the interest of 9*l.* at 6 per cent. for 5 months is 9×5=45=4$\frac{5}{10}$*s.*=4*s.* 6*d.*

Int. on		Ans.	Int. on		Ans.
7*l.*	for 3 months	2*s.* 1*d.*	24*l.*	for 6 months	14*s.* 4*d*
12*l.*	— 4 —	4*s.* 9*d.*	32*l.*	— 7 —	22*s.* 4*d*
16*l.*	— 5 —	8*s.*	64*l.*	— 3 —	19*s.* 2*d*
270*l.*	— 7 —	9*l.* 9*s.*	90*l.*	— 8 —	72*s.*
350*l.*	— 8 —	14*l.*	380*l.*	— 9 —	17*l.* 2*s.*

ANSWERS.

NUMERATION.

1.] One—Two—Three—Four—Five—Six—Seven—Eight Nine—Cipher.

2.] Ten—Eleven—Fourteen—Sixteen—Nineteen—Twenty—Forty-two—Eighteen—Seventeen.

3.] Two hundred—Four hundred and twenty—Six hundred and seven—Nine hundred and eighty-six—Four hundred and seventy-three—Two hundred and forty-seven—Three hundred and sixty-four.

4.] Nine hundred and twelve—Eight hundred and seventy-four—Seven hundred and eighty-three—Six hundred and fifty—Two hundred and two—Six hundred and four—Five hundred and ten.

5.] Four thousand—Two thousand seven hundred—Eight thousand six hundred and one—Seven thousand and thirty-six—Two thousand one hundred and one—One thousand and sixty.

6.] One thousand and ten—Seven thousand and thirty—Four thousand six hundred—Nine thousand one hundred and eleven—Four thousand and seventy-six—Five thousand eight hundred and seventy.

7.] Twenty-six thousand and twelve—Seventy thousand one hundred and one—Forty-two thousand one hundred—Thirty six thousand one hundred—Ninety thousand two hundred and one.

8.] Seven hundred thousand—Seven hundred and one thousand and twenty—Nine hundred and twenty-six thousand four hundred and twenty-seven—One hundred and four thousand two hundred and six.

9.] Nine millions—Nine millions seven hundred and sixty-four thousand two hundred and sixty-eight—Eight millions two hundred and two thousand one hundred —Five millions twenty-three thousand and sixty-seven.

10.] Two millions six hundred thousand and sixty—Four millions one hundred and one thousand and ten—Two millions four thousand—One million four hundred and two thousand one hundred and forty-nine.

1.] Forty millions—Twenty-nine millions six hundred and two thousand six hundred and eighty-seven—Fifty millions twenty-six thousand and seventeen—One million six hundred and seventy thousand and twenty.

12.] Nine hundred and forty-one millions two hundred and sixty-eight thousand seven hundred and sixty-seven —Two hundred and sixty-seven millions six hundred and two thousand six hundred and seven—Four hundred and one million four hundred and sixty-seven thousand six hundred and eighty.

13.] Two hundred and ninety-six millions twenty-six thousand eight hundred and seventy-six—Seven hundred and ten millions twenty thousand and ten—Two hundred and seventy millions six hundred and three thousand and fifty.

14.] One thousand four hundred and two millions three hundred and sixty thousand seven hundred and forty —Three thousand four hundred and sixty millions seven hundred and sixty thousand and ten—Four thousand and twenty-three millions six hundred and one thousand four hundred and ninety-seven.

15.] Seven thousand and forty-two millions six hundred and three thousand seven hundred and fourteen—Five thousand and seventy-nine millions six hundred and seven thousand nine hundred and six—One thousand seven hundred and four millions seventy thousand six hundred.

16.] Eighty-one thousand four hundred and sixty-two millions three hundred and six thousand and twelve—Forty-six thousand and seven millions six hundred and eighty-seven thousand six hundred and eighty-one—Ninety-four thousand and eighty-six millions four hundred and twenty-one thousand three hundred and sixty.

17.] Fourteen thousand and twenty-three millions six hundred and forty-one thousand two hundred and one—Twenty thousand eight hundred and sixty millions two thousand and one—Forty thousand and two millions two hundred and two.

18.] Nine hundred and seven thousand and sixty millions two hundred and six thousand two hundred and four—Two hundred and forty thousand and twenty-six millions one hundred thousand two hundred and one—Five hundred and ninety thousand nine hundred and sixty millions one hundred and twenty-six thousand and twenty.

NOTATION.

1.] 6—7—9—8—5—10—12—14—16—18—20—19.

2.] 74—26—31—49—58—62—76—77—97—84—55—99.

3.] 100—104—244—691—750—909—999—802.

4.] 4000—4200—5352—6705—7050—9002—8080—6707.

5.] 10000—15560—19019—26595—38038—40040—56502—70777.

6.] 400000—400040—600707—980000—256975—700707—964259.

7] 6000000—5493000—8040402—7493765—10010010—20240606—53053058—853948653—203406508—993000000.

SIMPLE ADDITION.

1.	1185
2.	1246
3.	1348
4.	1465
5.	2249
6.	2072
7.	2341
8.	2856
9.	975
10.	1635
11.	1516
12.	1056
13.	34957
14.	21867
15.	18068
16.	10913
17.	30154
18.	18001
19.	20169
20.	14372
21.	411093
22.	351624
23.	278538
24.	248663
25.	105
26.	298
27.	408
28.	1475
29.	15388
30.	4257
31.	27731
32.	1658286
33.	7861214
34.	586146
35.	75675
36.	811013
37.	£57821
38.	2246
39.	72
40.	204
41.	251
42.	68391
43.	2263
44.	£2197
45.	162
46.	5681
47.	415
48.	£84

SIMPLE SUBTRACTION

1.	184	31.	704026138872
2.	476	32.	424575325955
3.	342	33.	417801945959
4.	456	34	116879998308
5.	536	35.	457555
6.	375	36	1205995
7.	463	37.	3599244
8.	531	38.	57956
9.	96	39.	£8072
10.	90	40.	171
11.	16175	41.	314
12.	18943	42.	172
13.	25972	43.	178
14.	70747	44.	106
15.	36919	45.	135
16.	78373	46	759
17.	40253	47	1286517
18.	38999	48	11
19.	22984	49	130
20.	15289	50	740
21.	78359	51	2830
22.	25292	52	875334
23.	462121935	53	[illegible] millions
24.	435195169	54	[illegible]672904
25.	73922070	55	5820
26.	612663992	56	602
27.	722995412	57	1794
28.	91310919	58.	85
29.	813841778927	59.	183
30.	769808830048	60.	387

MIXED QUESTIONS IN ADDITION AND SUBTRACTION.

1.	83 left.	5.	415 got safe.
2.	2720 remain.	6.	221 remain.
3.	1557 returned.	7.	1244556 exceeds by
4.	162 to go.	8.	£287 remaining.

SIMPLE MULTIPLICATION.

1.	17104	23.	688289
2.	134574	24.	393308
3.	432265	25.	786616
4.	225804	26.	589962
5.	66276	27.	491635
6.	672608	28.	884943
7.	389304	29.	1179924
8.	748790	30.	1081597
9.	502557	31.	6823648
10.	1162248	32.	13386366
11.	574875	33.	23249952
12.	548668	34.	18221409
13.	350184	35.	23150412
14.	612822	36.	20896344
15.	787914	37.	19912230
16.	525276	38.	13825056
17.	262638	39.	56518416
18.	437730	40.	22039992
19.	875460	41.	57667632
20.	963006	42.	71550144
21.	1050552	43.	63221592
22.	196654	44.	74644808

45	29050420	62.	175320
46	48844096	63.	£2912
47	84393932	64.	2592 feet.
48.	430143168	65.	2303 letters.
49	777566496	66.	8168 bottles.
50	859831304	67.	£3240
51	63073762	68.	4480 pop.
52	41281053	69.	8650 pence.
53.	24294591	70.	2144
54.	28047414	71.	81056
55.	46350656	72.	783
56.	575630377	73.	80
57.	395494873	74.	1095 hours.
58.	649435896	75.	56940
59.	64008924	76.	768000
60.	3704412744	77.	£155168
61.	403576660	78.	111690 miles.

SIMPLE DIVISION.

1.	6911—1	12.	7140973—5
2.	13752—4	13.	3906406—4
3.	13281—1	14.	5859550
4.	11517—1	15.	12667006—5
5.	9553—2	16.	478066—7
6.	3186—2	17.	5894371—5
7.	6426—8	18.	28236344—1
8.	4206—1	19.	18824229—2
9.	6868906	20.	14118172—1
10.	5335955—2	21.	11294587—4
11	18771812—3	22.	9412114—5

23. 8067527
24. 7059086— 1
25. 6274743— 2
26. 5647268— 9
27. 5133880— 9
28. 4706057— 5
29. 37484011— 1
30. 24989341
31. 18742005— 3
32 14993604— 8
33. 12494670— 3
34 10709717— 4
35. 9371002— 7
36. 8329780— 3
37. 7496802— 3
38. 6815274— 9
39. 6247335
40. 26654—14
41. 41315—17
42 40364—12
43. 24995— 2
44 17862—35
45 8703— 9
46. 6828—32
47. 4408—28
48. 10902—34
49. 1889—64
50. 3309—88
51. 3450—76
52. 1767—22
53. 1726—18
54. 1687— 8
55 1649—31
56. 1613—88
57. 107-513
58. 92-728
59. 181—26
60. 143—30
61. 250—43
62. 149-857
63. 123-819
64. 355—78
65. 244-295
66. 204—91
67. 174—55
68. 141-265
69. 118-555
70. 209—41
71. 532-155
72. 101-846
73. 167-398
74. 216-355
75. 127-555
76. 10914—74
77. 1022-570
78. 9591-218
79. 9902-383
80. 7234-312
81. 700-1507
82. 857-1713
83. 4186—11
84. 953-2014
85. 2513-1409
86. 2587-1292

87.	954— 308	94.	670— 7
88.	1061—2116	95.	45— 2
89.	375—2602	96.	36 hours.
90.	418—7464	97.	266—20000
91.	2252—4000	98.	2066666— 30
92.	14–65474	99.	192268— 240
93.	290— 188	100.	925– 25

COMPOUND ADDITION

	£	s.	d.		£	s.	d.
1.	328	10	0	12.	4002	18	9¼
2.	241	5	7	13.	0	15	4
3.	107	9	0½	14.	1	10	5½
4.	3904	7	1¾	15.	9	5	3
5.	3621	13	6¾	16.	2	12	1
6.	2774	10	7½	17.	1264	18	5
7.	4660	7	0¾	18.	503	10	5
8.	3560	17	11	19.	1868	11	8
9.	3717	18	9½	20.	1912	2	8½
10.	4110	2	11¾	21.	9652	1	10¼
11.	4284	11	6¾	22.	17	15	1

COMPOUND SUBTRACTION.

	£	s.	d.		£	s	d.
1.	48	16	9¾	6.	36	17	8¾
2.	18	19	2¼	7.	80	18	11¼
3.	58	18	8¼	8.	16	6	7¾
4.	[illegible]9	16	8¾	9.	18	14	0
5.	69	2	2¼	10.	38	14	11¾

11	£17	6	11½	19.	£14	1	2¾
12	30	12	11½	20.	109	19	6
13	2807	16	9¾	21.	111	2	6¼
14	14319	18	3½	22.	21529	11	6
15	3500	[illegible]	5¾	23.	175	13	10
16	770	0	3	24.	58	11	4
17	337	0	0	25.	4166	19	6
18	125	1	6				

COMPOUND MULTIPLICATION.

	£	s.	d.		£	s.	d
1	399	11	9¼	21.	442428	9	0¾
2.	412	8	7½	22.	549253	14	2
3.	306	2	4½	23.	8585	10	9¾
4.	463	3	8	24.	1927	8	1½
5.	126	5	0¾	25.	4072	14	8
6.	876	3	9	26.	71618	18	0
7.	867	3	1¼	27.	219861	1	2
8.	719	15	6	28.	307812	13	2¼
9.	610	11	8¼	29.	218342	7	4
10.	548	7	8	30.	241165	18	11½
11.	349	6	1¾	31.	529051	8	10
12.	239	17	4½	32.	681984	18	2¼
13.	4408	10	6	33.	0	4	4
14.	6500	3	1½	34.	1	11	6
15.	6475	6	4½	35.	2	7	8
16.	44130	15	11	36.	0	10	6
17.	90483	3	1½	37.	41	15	6
18.	314848	12	10	38.	10	16	0
19.	302657	16	9¼	39.	115	10	0
20.	410410	15	4	40.	15	14	10¼

41	20	13	0	51.	268 .	2	$5\frac{3}{4}-\frac{3}{4}$
42.	42	13	$10\frac{1}{2}$	52.	1096	2	$4\frac{3}{4}$
43.	501	17	6	53.	9402	8	$7\frac{1}{2}-\frac{1}{4}$
44	6170	12	6	54.	5505	7	$2\frac{3}{4}$
45.	37	14	0	55.	53	18	$8\frac{3}{4}-\frac{3}{4}$
46.	2002	4	0	56.	47	7	$2\frac{3}{4}$
47.	254	7	6	57.	2321	13	$2\frac{3}{4}$
48.	923	0	0	58.	5208	9	$5\frac{3}{4}-\frac{4}{5}$
49.	18	11	3	59.	39264	7	$9-\frac{6}{7}$
50.	60	13	$10-\frac{3}{4}$	60.	81637	4	$4\frac{1}{4}-\frac{3}{5}$

COMPOUND DIVISION.

	£	s.	d.		£	s.	d.
1.	34	8	$10\frac{3}{4}$	18.	400	1	$9\frac{1}{2}-\frac{5}{16}$
2.	14	4	$1-\frac{1}{3}$	19.	723	9	$8\frac{1}{4}-\frac{9}{12}$
3.	17	9	$7\frac{3}{4}-\frac{3}{4}$	20.	778	19	$9\frac{1}{4}-\frac{4}{9}$
4.	149	15	$0-\frac{2}{5}$	21.	458	17	$10\frac{1}{4}-\frac{6}{8}$
5.	29	9	$11\frac{3}{4}-\frac{1}{6}$	22.	730	4	$9-\frac{3}{12}$
6.	58	4	$10\frac{1}{2}-\frac{4}{7}$	23.	19	7	$8\frac{1}{2}-\frac{2}{5}$
7.	1080	19	$8\frac{3}{4}-\frac{7}{8}$	24.	4	13	$5\frac{1}{2}-\frac{4}{16}$
8	834	5	$11\frac{1}{4}-\frac{5}{9}$	25.	53	7	$0\frac{3}{4}$
9.	506	0	$0\frac{1}{2}-\frac{9}{16}$	26.	2	7	$11\frac{1}{2}$
0.	789	16	$3\frac{1}{4}$	27.	0	10	$8\frac{3}{4}-\frac{5}{9}$
11.	392	12	$7\frac{1}{2}-\frac{6}{12}$	28.	1	17	$6\frac{1}{4}-\frac{3}{9}$
12.	14	2	$1-\frac{1}{7}$	29.	8854	4	0
13.	5	19	$2\frac{1}{4}-\frac{3}{8}$	31.	1	14	$1\frac{3}{4}-14$
14.	7	11	$0-\frac{5}{9}$	32.	2	2	$6\frac{3}{4}-34$
15	72	0	$1\frac{1}{2}-\frac{7}{12}$	33.	3	6	$10-95$
16	97	19	$1\frac{3}{4}$	34.	2	3	$9\frac{1}{4}-33$
17	62	5	$7-\frac{1}{5}$	35.	3	1	$0-457$

36.	£6	16	5½—531	58.	£10	3	8¾—49
37.	8	15	3 —454	59.	11	9	6½—16
38.	6	0	3¼—109	60.	979	2	8
39.	17	9	1¾—¾	61.	85¼		
40.	1	5	8¼—62	62.	0	16	6 —12
41.	3	6	1 —11	63.			25000000 di
42.	3	5	10¾—194	64.			2852—2229
43.	2	0	7¾—184	65.	14	10	8¼—858
44.	9	0	6½—136	66	0	5	0¾—1910
45.	10	7	1¼—387	67.	21	5	11¼
46.	10	0	5¾—609	68.	4	16	0¾—24
47.	12	4	1¾—3	69.	0	0	2 —8491
48.	10	7	7¼—3	70.	0	0	0¾-228504
49.	12	12	8¾—15	71.	0	0	8¼—22169
50.	17	16	10½—56	72.	0	0	0½—85791
51.	12	7	3 —54	73.	0	0	0¼-183482
52.	9	8	0¼—185	74.	0	0	3—166957
53.	13	13	2	75.	0	4	7¼—8770
54.	9	4	7¾—9	76.	0	0	0½—469854
55	4	11	11¼—39	77.	0	0	9¼-1922
56	10	1	9½—109	78.	0	0	1—511821
57	9	10	9¾—201	79.	0	0	4½—115068

REDUCTION.

1	11882 farthings.	7.	87552 farthings
2.	68478 pence.	8.	10692 pence.
3.	350150 farthings.	9.	£8394 10s.
4.	118865 halfpence.	10.	£444 13s. 3d.
5.	69552 pence.	11.	1751 gs. 18s.
6.	71520 farthings.	12.	1146 cr. 2s. 10

13. 113067 fourpences.
14. 9880 crowns.
15. £4884 10*s.*
16 4947*s.* 6*d.*
17 873740 threepences.
18 57552 fivepences.
19 9621 fourpences 1½*d.*
20 31932080 sixpences.
21 33465 cr. 3*s.*
22. 118801½ seven shillings.
23. 36672 fivepences.
24. 2282 eightpences ¾*d*
25. 16048 half-sovs. 2*s.*
26. 7327589 farthings.
27. 2890160 farthings.
28. 205075 ninepences.
29. 237725 three farthings
30. 6152 fivepences.

WEIGHTS AND MEASURES.

AVOIRDUPOIS WEIGHT.

	cwt.	qrs.	lbs.	oz.	dr.
1.	29	1	19	0	0
2.	2	2	14	15	0
3.	6	2	11	0	0
4.	0	7	23	14	0
5.	46	2	14	0	0
6.	6	1	17	12	0
7.	2	1	21	8	0
8.	0	2	4	6	$12\frac{4}{9}$
9.	3	2	27	0	0
10.	9	3	4	0	0
11.	519	3	19	0	0
12.	21	0	13	12	0
13.	2854	1	27	2	13
14.	4	1	12	8	7
15.	211	3	1	4	0

16.	8 cwt. 8 qrs. $5\frac{1}{11}$ lbs.
17.	1 cwt. 3 qrs. 26 lbs. 9 oz. $6\frac{4}{15}$ dr
18.	$67\frac{3}{5}$ parcels.
19.	1 cwt. 1 qr. 15 lbs. 2 oz. $8\frac{20}{38}$ dr
20.	475 hogsheads. 910 rem.
21.	192 tons. 19 cwt. 3 qrs. 6 lbs

TROY WEIGHT.

	bs.	oz.	dwts.	grs.
22.	194	4	16	0
23.	0	389	10	6
24.	16	11	4	6
25.	0	6	5	$6\frac{4}{7}$
26.	15	4	1	14
27.	3	11	11	6
28.	30	7	8	8
29	8	0	14	$13\frac{4}{13}$
30.	104	8	0	0
31.	25—$\frac{133}{389}$d.			
32.	6	6	16	12

LONG MEASURE.

	mls.	fur.	per.	yds.	ft.	in
33.	0	29	36	3	0	0
34.	0	2	2	4	2	0
35.	0	4	30	$2\frac{1}{2}$	0	0
36.	0	0	3	$2\frac{1}{2}$	2	0
37.	118	5	18	$3\frac{1}{2}$	0	0
38.	4	5	5	0	0	0
39.	92	3	20	0	0	0
40.	1	5	13	0	0	0
41	16	5	33	0	2	10

CLOTH MEASURE.

42.	118yds.	0qrs.	2nls.	48.	443yds.	1qrs.	0nls.
43.	830	0	3	49.	20	3	$1\frac{6}{9}$
44.	9	0	$3\frac{6}{7}$	50.	47 yds.		
45.	4	0	$1\frac{4}{9}$	51.	10	1	1
46.	148	0	1	52.	11—$\frac{41}{54}$ suits.		
47.	19	0	0				

SQUARE OR LAND MEASURE.

53.	167ac.	2rd.	14per.	58.	1ac.	1rd.	9per.
54.	189	2	4	59.	29	1	16
55.	22	1	30	60.	1	1	$26\frac{3}{12}$
56.	24	2	30	61.	65	0	33
57.	29	0	21	62.	2*s.* $3\frac{1}{4}$*d.*—4267		

MEASURE OF CAPACITY.

63.	195qrs.	6bush.	1pks.	69.	244qrs.	3bush.	0pks.	
64.	697	4	0	70.	41	8	$3\frac{1}{6}$	
65.	10	7	$2\frac{3}{4}$	71.	1049gals.	1qt.	1pt.	
66.	8	6	$0\frac{6}{9}$	72.	13gals.	2qts.	1pt.	3gls.
67.	175	1	0	73.	224lds.	4qr.	5bsh.	8pk
68.	16	6	2	74.	806gals.	2qts.	1pt.	

TIME.

75	178yrs. 6wks. 5dys.	80.	2wks. 0dys. 19hrs
76	177dys. 12hrs. 28min.	81.	47hrs. 7min. 30sec
77.	15yrs. 47wks. 5dys.	82.	30ds. 10hrs. 29m.$4\frac{9}{12}$s.
78.	29dys. 15hrs. 30min.	83.	347126307 seconds.
79	56wks. 2ds. 11hrs. 16m.		

REDUCTION.

AVOIRDUPOIS WEIGHT.

1. 854 lbs.
2. 1584 oz.
3. 89 lb. 3 oz.
4. 7032 lbs.
5. 812 parcels.

TROY WEIGHT.

6. 5760 dwt.
7. 5 oz. 2 dwt. 20 gr.
8. 5184 gr.
9. 6 spoons.
10. 23 oz. 2 dwt. 0 gr.
11. 21 spoons.

APOTHECARIES' WEIGHT.

12. 27160 grains.
13. 5oz. 1dr. 1scr. 7gr.
14. 186 scruples.
15. 252 days.

LONG MEASURE.

16. 24560 perches.
17. 1332 yds. 1 ft. 4 in.
18. 200640 yards.
19. 57200 times.
20. 39600 times.

CLOTH MEASURE.

21. 3936 nails.
22. 299 yds. 2 nls.
23. 8 shirts.—8
24. 7 suits.—8

MEASURE OF CAPACITY

25. 197 pints.
26. 585gal. 3qts. 1pt
27. 3863 pecks.
28. 1199 bushels.
29. 2016 gills.

TIME.

30. 1094 hours.
31. 51dys. 20hr. 57m
32. 5302080 minutes
33. 341640 times.

SIMPLE PROPORTION.

1.	108s.	14.	165 ft. 2 in.—8
2.	£3 18 0	15.	405 men.
3.	£44 12 7½	16.	9*d.*—6
4.	44 9 4	17.	12 days.
5.	0 5 2	18.	7 dys. 9 hrs.
6.	3 13 $5\frac{1}{15}$	19.	3¾ months.
7.	147 6 8	20.	1⅓ month.
8.	5 0 2¾	21.	13⅓ days.
9.	5lb. 4oz. 6dr.—6	22.	1800 lbs.
0.	5*s.* 9¾*d.*—264	23.	6¼*d.*—1276
1.	£196 16*s.* 0¾*d.*—48	24.	£11 8*s.* 8½*d.*—6
2.	1333lbs. 9oz.—4	25.	137lbs. 7oz.—26
3.	£2380 10*s.*	26.	£75 15*s.* 4¼*d.*—336

COMPOUND PROPORTION.

1.	425 roods.—369	6.	10 horses.
2	£38 8*s.*	7.	2250 men.
3.	240 acres.	8.	55⅝ days.
4.	58½ suits.	9.	£37 3*s.* 7½*d.*
5.	145 men.	10.	£5 3*s.*

BILLS OF PARCELS.

Bookseller's bill...............	£5	18	6
Hosier's bill....................	3	16	4
Grocer's bill	11	10	1

BILL OF BOOK DEBTS.

Wine merchant's bill £49 18

PRACTICE

1.	£6	15	1½	33.	£131	0	1
2.	7	13	6	34.	147	18	2
3.	1	3	0	35.	517	8	0
4.	0	4	0	36.	118	8	0
5.	1	6	9	37.	72	0	0
6	8	8	4	38.	871	4	0
7.	30	6	4	39.	81	0	0
8.	4	11	0	40.	673	4	0
9.	180	19	0	41.	610	8	0
10.	169	9	4	42.	64	16	0
11	26	15	3	43.	642	16	0
12.	19	3	9	44.	1419	0	0
13	17	8	3	45.	1513	12	0
14	43	9	7¼	46.	918	15	0
15	35	14	2	47.	1230	18	0
16.	63	12	4½	48.	910	14	0
17.	45	14	2	49.	1441	12	0
18.	99	2	11¾	50.	3940	4	0
19.	94	12	0	51.	1800	10	0
20.	133	9	8¼	52.	3172	8	0
21.	48	16	9½	53.	1262	8	0
22.	105	8	7½	54.	3908	9	0
23.	102	9	10½	55.	5331	18	0
24.	175	18	8	56.	1512	0	0
25.	123	2	7½	57.	2949	12	0
26.	125	13	1¼	58.	1027	18	0
27.	297	1	4½	59.	3710	14	0
28.	278	13	0¼	60.	7258	19	0
29.	328	13	9	61.	89	12	0
30.	87	19	7½	62.	93	4	11
31	182	11	5	63	82	14	6
32	172	16	6¾				

64.	£263	6	1½
65.	149	9	0
66.	606	18	0
67.	1140	6	8
68.	1588	0	4
69.	905	15	7½
70	3280	2	5.
71	2694	14	6
72.	1931	4	0¾
73.	3380	6	10½
74.	5099	17	11
75.	770	12	10
76.	1885	14	0
77.	4795	10	11¼
78.	3651	19	1
79.	8067	12	2¼
80	3637	2	9¼
81.	2261	4	8
82.	2862	17	9
83.	6631	2	2¼
84.	625	6	8
85.	2966	15	2
86.	1935	11	3
87.	3676	9	3
88.	7661	10	0
89.	59530	18	0
90.	41565	2	4
91.	42161	18	9
92.	25030	2	1½
93.	95335	17	9
94.	84203	5	5
95.	82671	6	0

96.	£32039	4	0
97.	92421	6	4
98.	56595	1	4
99.	46824	9	3¼
100.	109872	15	0
101.	163931	19	3
102.	137446	13	4
103.	86621	5	11
104.	250427	9	5

CASE VI.

105.	20	2	7¾
106.	351	0	5
107.	351	15	8¼
108.	42	10	2½
109.	143	3	9
110.	69	9	9¾
111.	53	6	11
112.	37	6	6½
113.	95	11	9½
114.	182	7	9¾
115.	260	9	1½
116.	230	9	5
117.	169	9	7¾
118.	400	6	11¾
119.	372	4	8½
120.	443	13	7½
121.	237	0	3¾

CASE VII.

122.	16872	8	3
123.	34226	16	1

124	8599	12	2	129.	8606	6	6
125.	1158	13	2¼	130.	8882	4	9½
126.	8486	17	9	131.	13747	9	6½
127.	41269	7	7¼	132.	82411	10	5
128.	50375	5	10¼	133.	4522	13	3¼

TARE AND TRET.

1	49cwt.	2qrs.	9lbs. net.	8.	56cwt.	3qrs.	7½lbs
2	10	0	2	9.	46	3	21½
3	50	3	3½	10.	22	1	24
4.	23	2	0	11.	167	2	25¾
5.	175	1	25	12.	30	2	9
6.	41	0	12	13.	36	1	14
7.	9	2	15	14.	£93 7s. 9¾d.		

SIMPLE INTEREST.

1.	£53	8	0	14.	£757	1	1¼
2.	231	10	9	15.	132	9	8½
3.	479	12	4¾	16.	1116	10	7¾
4.	237	5	3	17.	2380	17	5¼
5.	13077	9	0	18.	1338	9	0
6.	551	8	6¼	19.	2	15	11
7.	2041	18	11¾	20.	14243	12	3
8.	6619	2	11½	21.	53	14	9¾
9	566	11	11¾	22.	2	3	8
10.	1428	2	3½	23.	876	18	5¾
11.	2	13	6¼	24.	1206	18	10
12.	5	10	7½	25.	120	6	6¼
13.	11	2	11	26.	266	6	8

DISCOUNT.

1.	£581 16 4½	3.	£4 10 0¾
2.	26 12 0½	4.	2 5 2¼

COMMISSION, BROKERAGE, INSURANCE, BUYING AND SELLING STOCKS.

1.	£12 8 4¾	13.	£835 16 0
2.	6 4 4½	14.	726 3 3½
3.	59 9 4¾	15.	12546 4 9½
4.	3 2 3	16.	10 14 10¼
5.	28 13 7	17.	14 11 7
6.	408 2 0	18.	44 15 4¾
7.	80 3 6¼	19.	270 13 6
8.	172 17 9½	20.	802 11 2½
9.	286 18 0¼	21.	29 17 0
10.	592 5 7	22.	3872 12 6
11.	494 8 5¾	23.	205 13 0
12.	86 15 10		

COMPOUND INTEREST.

1.	£66 4 0½	4.	£155 12 3¾
2	720 6 5¾	5.	964 10 7¼
3.	497 10 11¼	6.	237 14 5¾

BARTER.

1.	34⅓ pairs.	4.	$254\frac{1}{10}$ lbs.
2.	32 lbs.	5.	427¼—$\frac{1}{15}$ lbs.
3.	$63\frac{21}{23}$ gals.		

PROFIT AND LOSS.

1.	£25 12 0	6.	£12 16 4—$\frac{7}{1}$
2.	6 15 4	7.	49 10 11—$\frac{3}{3}$
3.	7 17 4	8.	18 15 0
4.	2 14 0	9.	5 0 0
5.	9 10 0		

PARTNERSHIP.

		£	s.	d.			£	s.	d.
1.	A's share,	240	1	11¼	5.	A's share,	172	13	4¾
	B's share,	723	18	0½		B's share,	633	4	10½
2.	A's share,	136	3	2½		C's share,	1542	1	8¼
	B's share,	238	3	7½	6.	A pays	25	18	4
	C's share,	149	13	1¾		B pays	28	6	11¼
3.	A's share,	29—$\frac{60}{468}$				C pays	43	14	8½
	B's share,	41—$\frac{396}{468}$			7.	A's share,	78	12	3½
	C's share,	25—$\frac{12}{468}$				B's share,	101	1	6¼
4.	A's share,	44	8	10½—$\frac{12}{18}$		C's share,	123	10	9
	B's share,	33	6	8		D's share,	134	15	4½
	C's share,	22	4	5¼—$\frac{6}{18}$					

VULGAR FRACTIONS.

REDUCTION.

CASE I.

1.	$2487\frac{3}{5}$	8.	$1\frac{1539}{2164}$
2.	$604\frac{1}{2}$	9.	$96\frac{4731}{7687}$
3.	$227\frac{25}{43}$	10.	351
4.	$92\frac{21}{608}$	11.	$1\frac{4401}{43760}$.
5.	$93\frac{86}{89}$	12.	$104\frac{4457}{7038}$
6.	$199\frac{29}{43}$	13.	$130\frac{1090}{3624}$
7.	$11\frac{502}{585}$	14.	$176\frac{1878}{4967}$

CASE II.

15.	$\frac{45}{2}$
16.	$\frac{26}{3}$
17.	$\frac{89}{5}$
18	$\frac{178}{9}$
19.	$\frac{193}{7}$
20.	$\frac{9707}{15}$
21.	$\frac{6130}{17}$
22.	$\frac{29301}{33}$
23.	$\frac{80329}{36}$
24.	$\frac{18487}{27}$
25.	$\frac{123000}{126}$
26.	$\frac{354934}{421}$
27	$\frac{76285}{111}$
28.	$\frac{180057}{234}$
29.	$\frac{601248}{621}$

CASE III.

30.	$\frac{30}{294}$
31.	$\frac{168}{1485}$
32.	$\frac{1615}{819}$
33.	$\frac{352}{1188}$
34.	$\frac{392}{323}$
35.	$\frac{5304}{98325}$
36.	$\frac{33048}{68376}$
37.	$\frac{605880}{58968}$
38.	$\frac{25056}{9232}$
39.	$\frac{261807}{55575}$

CASE IV

40.	$\frac{3}{17}$
41.	$\frac{23}{58}$
42.	$\frac{4}{11}$
43	$\frac{3}{10}$

44. $\frac{148}{1735}$

45. $\frac{191}{1310}$

46. $\frac{161}{432}$

47. $\frac{55}{128}$

48. $\frac{1}{180}$

49. $\frac{249}{44}$

50. $\frac{7}{8}$

51. $\frac{11}{12}$

CASE V.

52. $\frac{63}{84}$ $\frac{56}{84}$ $\frac{41}{84}$

53. $\frac{360}{648}$ $\frac{567}{648}$ $\frac{432}{648}$

54. $\frac{2223}{2717}$ $\frac{1463}{2717}$ $\frac{1716}{2717}$

55. $\frac{8073}{9936}$ $\frac{4752}{9936}$ $\frac{6624}{9936}$

56. $\frac{315588}{445536}$ $\frac{325584}{445536}$ $\frac{159120}{445536}$ $\frac{340704}{445536}$

57 $\frac{3769038}{8435466}$ $\frac{3893292}{8435466}$ $\frac{5861934}{8435466}$ $\frac{2919969}{8435466}$

58. $\frac{10561057803}{12048530733}$ $\frac{1800355167}{12048530733}$ $\frac{7046929530}{12048530733}$ $\frac{1111488075}{12048530733}$

59. $\frac{1738284308040}{857382543080}$ $\frac{201170391800}{857382543080}$ $\frac{666658671257}{857382543080}$ $\frac{987000070840}{857382543080}$

ADDITION.

1. $1\frac{96}{136}$

2. $2\frac{170}{1001}$

3. $2\frac{107}{2576}$

4. $2\frac{165113}{551747}$

5. $1\frac{194675}{198237}$

6. $3\frac{126945}{4556622}$

7. $1\frac{874}{10920}$

8. $3\frac{14102}{31122}$

9. $53\frac{315}{378}$

10. $4\frac{9783}{27945}$

11. $14\frac{10759}{58653}$

12. $11\frac{73425}{436455}$

SUBTRACTION.

1	$\frac{5}{28}$	7.	$1\frac{11}{40}$
2.	$\frac{34}{99}$	8.	$2\frac{37}{70}$
3.	$\frac{31}{195}$	9.	$\frac{73}{143}$
4.	$\frac{93}{247}$	10.	$\frac{173}{1512}$
5	$3\frac{30}{32}$	11.	$154\frac{4}{7}$
6.	$2\frac{11}{56}$	12.	$63\frac{7}{12}$

MULTIPLICATION.

1	$\frac{15}{32}$	7.	$60\frac{15}{32}$
2	$\frac{56}{99}$	8.	$17\frac{25}{48}$
3	$\frac{3}{4}$	9	$5\frac{1}{18}$
4.	$\frac{16}{351}$	10.	$5\frac{57}{91}$
5	$3\frac{31}{48}$	11.	$115\frac{252}{285}$
6.	$2\frac{9}{13}$	12.	$181\frac{611}{936}$

DIVISION.

1.	$3\frac{3}{55}$	7.	8
2.	$\frac{7}{8}$	8.	$8\frac{3}{4}$
3.	$1\frac{11}{64}$	9.	$\frac{18}{57}$
4.	$2\frac{54}{105}$	10.	$2\frac{13}{21}$
5.	$\frac{86}{111}$	11.	$65\frac{2}{5}$
6	$\frac{12}{39}$	12.	$1\frac{1}{2}$

REDUCTION, CONTINUED.

CASE VI.			
1.	$\frac{3}{6720}$£	3.	$\frac{4}{105}$ guinea
2.	$2\frac{6}{9}2$	4.	$1\frac{9}{7}2$ farthing
		5.	$\frac{7}{2160}$ crown

6. $\frac{3}{70}$ week.
7. $\frac{1176}{9}$ hour.
8. $\frac{4}{80}$ yard.
9. $\frac{200704}{8}$ dram
10 $\frac{4}{3800}$ mile.

CASE VII.

11 $\frac{29}{40}$£.
12. $\frac{13}{15}$£.
13. $\frac{91}{320}$£.
14. $\frac{213}{1}$*d.*
15. $\frac{319}{1}$ farthing.
16. $\frac{49}{100}$ day.
17. $\frac{1795}{28672}$ cwt.
18. $\frac{15456}{1}$ oz.
19. $\frac{200}{1}$ dwt.
20. $\frac{973}{1440}$ day.

CASE VIII.

21. 17*s.* $1\frac{1}{2}$—$\frac{6}{7}$*d.*
22. 10*d.*
23. 4*s.*
24. 19h. 38min. $10\frac{10}{11}$sec.
25. 12*s.* $9\frac{1}{4}$—$\frac{13}{23}$*d.*
26. 1 ft. 4 in.
27. 9 oz. 15 dwt.
28. 13 oz.
29. 3qr. 11lb. 6oz. $8\frac{8}{27}$dr.
30. 5fur. 26 per. 3yds. 2ft

PROMISCUOUS EXERCISES.

1. 9*s.* $4\frac{1}{4}$—$\frac{29}{35}$*d.*
2. 3*s.* 3*d.*$\frac{1}{120}$.
3. 12*s.* 8*d.*
4. $3\frac{3}{4}$—$\frac{47}{54}$f.
5. 11*s.* $8\frac{1}{2}$—$\frac{1}{3}$f
6. 4*s.* $3\frac{1}{49}$*d.*
7. 3*s.* 6—$\frac{26}{217}$*d.*
8. $16\frac{52}{2933}$*s.*
9. 1 mile, 3 fur.
10. $1558\frac{22}{50}$ oz.
11. 3*s.* $4\frac{1}{3}$*d.*
12. 4 cr. $1\frac{11}{70}$*d.*
13. 7 yds. 2 qrs.
14. 2*s.* 6*d.*
15. $2\frac{1}{8}$*d.*
16. £4 2*s.* $11\frac{5}{8}$*d.*
17. 6*s.* 4*d.*
18. £227 12*s.* 1*d*
19. 6*s.* $1\frac{1}{2}$—$\frac{6}{7}$*d.*
20. 14 lbs.
21. £51 3*s.* $1\frac{533}{871}$*d*

DECIMAL FRACTIONS

ADDITION.

	671·458	5.	4541·03777
2.	806·698	6.	7396·1408
3.	1133·372	7.	5558·5850
4.	1874·2784	8.	134·580

SUBTRACTION.

1	67·517	6.	182·7044
2.	8·045	7.	70·0846
3.	34·1202	8.	810·8879
4.	297·0121	9.	242·245787
5.	669·021	10.	327·2158

MULTIPLICATION.

1.	·0729	7.	110440·502
2.	14·3561	8	·492961
3.	7766·1112	9.	78·6
4.	·04118408	10.	3·6465
5.	5542	11.	40006
6.	3·79	12.	76

DIVISION.

1.	2·8808+	7.	19·0202+
2.	1·784+	8.	9·114+
3.	10·854+	9.	3·81009+
4.	1·7807+	10.	2·161+
5.	·024	11.	348·518+
6.	2·96	12	8·4689

REDUCTION.

CASE I.

1.	·625
2.	·25
3.	·275
4.	·333+
5.	·833+
6.	·166+
7.	·5625
8.	·0133+
9.	·9411+
10.	·7272+
11.	·0715+
12.	·00053+

CASE II.

1.	[illegible]
2.	[illegible]
3.	[illegible]
4.	$\frac{1}{250}$
5.	$\frac{1}{160}$
6.	$\frac{3}{1600}$
7.	$\frac{41}{160}$
8.	$\frac{21}{1600}$
9.	$\frac{7}{1400}$
10.	[illegible]

CASE III.

1.	£·9729+
2.	£·790625
3.	£·6666+
4.	£·0375
5.	cwt. 8·57142
6.	yd. 1·4166+
7.	wk. ·00263
8.	ells ·63437
9.	guin. ·0188
10.	oz. ·275
11.	acre ·575
12.	mile ·00994

CASE IV.

1.	15*s*. 8*d*.
2.	6*s*. 9¾*d*.
3.	1¾*d*.
4.	3qrs. 1lb. 9oz. 1dr
5.	14oz. 15dr.
6.	15lbs. 10oz. 14dr.
7.	8¾*d*.
8.	4½*d*.
9.	22hrs. 7min. 23sec
10.	1qr. 3nl. 2in.
11.	25per. 2yd. 1ft. 9in
12.	8oz. 15dwt. 16dr
13.	15 drams.
14.	19dwt. 17gr
15.	12oz. 7dr

INVOLUTION.

1.	64	4.	2476099
2.	2197	5.	1291467969
3.	1048576		

EVOLUTION.

1.	176	5.	69·047+
2.	789	6.	15·08
3.	1111	7.	$\frac{7}{12}$
4.	45·3	8.	$\frac{14}{37}$

CUBE ROOT.

1.	72	6.	87·5
2.	88	7.	19·86+
3.	73	8.	·376
4.	103	9.	829+
5.	439	10.	1·93+

DUODECIMAL MULTIPLICATION.

	ft.	in.	″	‴	⁗		
1.	42	7	6	0	0	10.	564ft. 0in. 9″
2.	44	5	2	7	6	11.	£6 9s. 7$\frac{1}{5}$f.
3.	106	9	0	[illegible]	8	12.	£126 9s. 4$\frac{1}{4}$—$\frac{1}{3}$f.
4	565	11	4	9	8	13.	116ft. 10in. 6″
5.	1040	8	4	4	6	14.	100ft. 4in. 1″ 6‴
6	17105	2	8	4	6	15.	8419ft. 2in. 7″ 2‴ 10⁗ 6‴‴
						16.	£2 1s. 0d.
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	77ft. 8in. 5‴